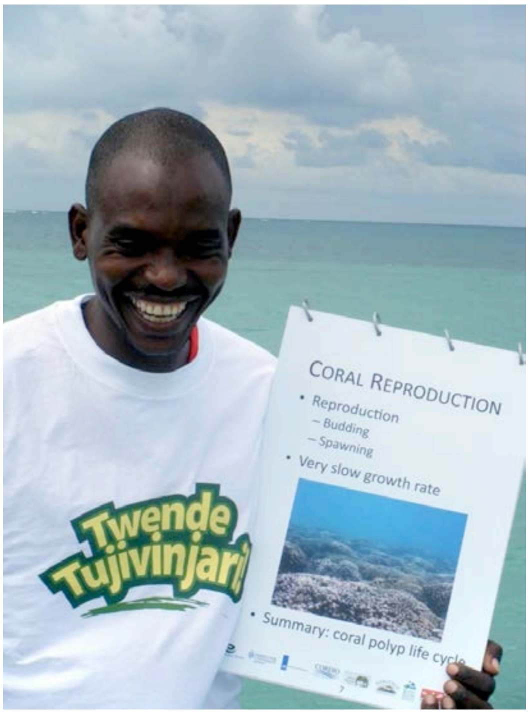
Effective Interpretation for Recreational Marine Resource Use in the Mombasa Marine Park and Reserve, Kenya



Thesis submitted by

Sander Diego den Haring MSc

in February 2014

for the degree of Doctor of Philosophy

in the School of Earth and Environmental Sciences

James Cook University

Townsville, Australia

This thesis is dedicated to my son, Eric den Haring: lost but not forgotten.

I declare that this thesis is a product of my own research. The content of this thesis has not been submitted in any form as part of another degree at another tertiary education institution. All published and unpublished work of others has been acknowledged and referenced throughout the thesis. A comprehensive list of references is included. All research reported in the thesis has received the approval of the relevant ethics committee. Every reasonable effort has been made to gain permission and acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

Signature: Date: Feb 25 2014

Sander D. den Haring

Acknowledgements

As with most achievements, the culmination of this thesis has been the result of a team effort allowing me to produce and assign my name to this thesis. My sincere thanks go out to everyone that was involved in this research project either directly or indirectly, without your continued support my PhD candidature would not have been as efficient as I felt it was. I would like to express my gratitude to several key persons/organizations that deserve a separate mention.

My wife and daughter have suffered the greatest burden throughout my candidature as they waved me good-bye every morning and welcomed me home every evening. Often times the tides dictated that I venture out to the beach to collect data during weekends, and holidays. These moments are known to be crucial for families in that they offer quality family time. My data collecting often intruded into these special moments and not once did my family begrudge me to hit the beach and gather my important data. My wife offered continued support and enduring love throughout my candidature and I hope I will be able to repay that now that this bumpy ride is nearing completion. The smile on my daughters face every day when I returned reminded me of what I had missed that day, weekend, or holiday, yet gave me the strength I needed to continue. I love that happy smile and I love both my wife and daughter very much.

My supervisors have all had their fair share of communications from me expressing despair, advice, assistance and general problem-solving comments. Throughout my candidature my supervisors have always made time for my comments and I never felt as if I bothered them. Often times their comments left me frustrated: rather than answering my comments directly, they pushed me towards answering my own questions and seeking out the information I required. I see now how this has bestowed upon me a valuable skill that will continue to benefit me in my future career as a researcher. Stephen Sutton is acknowledged in that he always opened his door to me when I needed some additional confidence, expert advice or general compassion and understanding. His advice and feedback, particularly during the write up of this thesis deserve an abundance of gratitude. Steve's passion for science and the time he makes for his PhD students are truly admirable qualities enjoyed by many others and myself. David Obura is acknowledged for his practical suggestions during the fieldwork portion of my research project. His comprehensive understanding of the Mombasa area greatly assisted my research project and saved me endless weeks of otherwise having to learn it all myself. Peter Valentine is acknowledged for his words of wisdom that provided my research project with direction. His extensive background assisted me in fine-tuning my research project into what it has become. Margaret Gooch is acknowledged for her never-ending kindness and making me feel welcome at JCU and in Townsville. Her suggestions often led me to think ‘outside the box’ and allowed me to explore options I may not have considered.

My family abroad has always supported the decisions I have made and they did exactly the same when I expressed interest in pursuing a PhD at JCU.

Throughout my data collection I depended on the snorkel and dive operators for their logistical support in allowing me to join their excursions and interview their clients. This logistical arrangement was more than that though. The snorkel operators in the Mombasa Marine Park and Reserve made me feel extremely welcome on every excursion I accompanied and took a great interest in the research I was completing. Often times they went out of their way to facilitate my research and I am extremely grateful for their assistance and friendship. The diving excursions I accompanied were all hosted by Buccaneer Diving. I am greatly indebted to all the staff of Buccaneer Diving in facilitating my data collection. The cooperation offered by Buccaneer Diving is most likely a result of the owner, Bruce Phillips, being extremely environmentally minded (even if he doesn’t always admit it) and wanting to get involved when, and where ever possible.

The Kenya Wildlife Service offered continued support of my project throughout my research project and assisted me throughout. Special thanks go out to Corporal Abu Abdalla Bocha and Coxswain Abdalla Godana Abdalla for their unending patience and vast interest they had for my project and myself. KWS Assistant Director (Coast Region) Arthur Tuda was extremely instrumental in networking all the various Mombasa players throughout my candidature and I am greatly indebted to all that he has done for my project and myself. I aspire to be able to repay his kindness when he undertakes his PhD.

Final thanks go out to all the sponsors of the training workshop. The realization of this workshop was instrumental not only to my research project but also to the marine conservation effort and passion of the Mombasa Marine Park and Reserve. The following institutions offered financial assistance: James Cook University, British Ecological Society, Project AWARE, and The Netherlands Embassy in Nairobi, Kenya. The following institutions offered either logistical or ‘in kind’ assistance: CORDIO East Africa, Kenya Wildlife Service, GreenWater, Heritage Hotels Ltd and Fresha Events.

Statement on the Contribution of Others

Project Support

School of Earth and Environmental Sciences	AUD 500
School of Education	AUD 500
British Ecological Society	GBP 2000
Project AWARE	GBP 2150
ANNiMS	AUD 4975
Netherlands Embassy in Nairobi	KSH 282,500
Graduate Research Fund-SEES 2010	AUD 1344
Internal Research Award-SE 2010	AUD 910
Graduate Research Fund-SEES 2011	AUD 1000
Graduate Research Fund-SEES 2012	AUD 806
Graduate Research Fund-SEES 2013	AUD 500
School of Earth and Environmental Sciences	AUD 624
Heritage Hotels Ltd	in kind funding
CORDIO East Africa	in kind funding
Kenya Wildlife Service	in kind funding
GreenWater	in kind funding
Fresha Events	in kind funding

Stipend

James Cook University Post Graduate Research Scholarship

AUD 20427 stipend per annum

AUD 20200 tuition fees per annum

James Cook University Six-Month Write Up Grant

AUD 24653 stipend per annum

Supervision

Dr Stephen Sutton

Associate Professor Peter Valentine

Dr David Obura

Dr Margaret Gooch

Assistance with Data Collection

Buccaneer Diving (permission to accompany daily dive excursions)

Snorkel Boats in the Mombasa Marine Park and Reserve (permission to accompany daily snorkel excursions)

Statistical Support

Carole Wright

Carla Ewels

Abstract

Recreational use of marine resources may result in irreversible impacts on the marine environment. Coral reefs, which are under increasing threat from numerous anthropogenic impacts, are particularly susceptible to damage by recreational use. Nature-based tourism research has shown that interpretation (i.e. the process of conveying a message and providing guidance to the visitor to create an understanding and an appreciation of natural resources) can be used to promote pro-environmental behavior (less detrimental to the environment) among visitors thereby reducing their impacts on the resources they use. However, few studies have investigated the efficacy of interpretation in minimizing the negative impacts created by visitors to marine areas. In this study, I explored the theoretical and applied dimensions of interpretation and its efficacy for encouraging more pro-environmental behavior among scuba divers and snorkelers on coral reefs in the Mombasa Marine Park and Reserve, Kenya.

I developed a theoretical framework to guide the research. According to the framework, behavior of scuba divers and snorkelers is a result of situational, personal and environmental factors. The theoretical framework incorporated behavior theory (the Theory of Planned Behavior) and communication theory (the Elaboration Likelihood Model) to guide the implementation and evaluation of interpretive efforts. Guided by the theoretical framework, I investigated four specific objectives: 1) to determine the drivers that influence the behavior of scuba divers (not coming within 10cm of the reef substrate), and snorkelers (not contacting the reef substrate) when they dive/snorkel, and, if this behavior is volitional; 2) to determine the salient beliefs of the scuba divers and snorkelers regarding the target behavior; 3) to investigate the efficacy of interpretation based on salient beliefs of snorkelers; and 4) to determine if behavioral beliefs of snorkelers changed for a long-term duration after interpretive efforts.

In the first stage of the study, I investigated the behavior of 192 scuba divers and 167 snorkelers to determine the drivers of this behavior and if the behavior was volitional (Chapter 2). Results showed that contact behavior (defined as contacting the reef substrate) of scuba divers and snorkelers was influenced weakly by experience (more experience resulted in fewer contacts), but was not significantly influenced by situational (i.e. dive site, dive guide) or environmental factors (i.e. current, visibility). Results indicate that visitors' direct interactions with the reef substrate are largely under their volitional control. Consequently,

according to the theoretical framework, it should be possible to influence these behaviors using interpretation targeted at the specific beliefs that underlie visitor's behavior.

Subsequently I monitored the in-water behavior of 159 scuba divers and 59 snorkelers (Chapter 3). I then interviewed these individuals to identify their salient beliefs about potentially damaging behavior to the reef (i.e. not coming within 10cm of the reef for the divers and not contacting the reef for the snorkelers). The most common beliefs identified were: the scuba divers and snorkelers believed that not making potentially damaging contacts would offer the reef protection, that the dive/snorkel guides are the people most likely to approve of them (the divers and snorkelers) not making potentially damaging contacts, and that the dive/snorkel guides are the people most likely to avoid potentially damaging contacts with the reef. The scuba divers also believed that not coming within 10cm of the reef substrate was disadvantageous to them as it prevents them (the divers) from seeing as much when they dive. Scuba divers furthermore believed that buoyancy control and favorable water conditions would make it easier for them not to come within 10cm of the reef when they dive. The snorkelers also believed the snorkel guides would disapprove of them (the snorkelers) not contacting the reef, and also, that deeper water and more information would make it easier not to contact the reef when they snorkel. Based on the theoretical framework, these salient beliefs should be targeted in interpretive efforts to realize behavior change.

In the next stage I investigated the efficacy of interpretation in influencing snorkel contact behavior (Chapter 4). Data from snorkelers were collected regarding their behavioral beliefs, normative beliefs, control beliefs, behavioral intentions, knowledge of marine ecosystems, snorkel behavior, and their perceptions of their snorkel experience. Based on these results and the salient beliefs collected in Chapter 3, I developed an interpretive program presented to snorkel boat operators in a dedicated workshop, and that they subsequently implemented on snorkel excursions. Upon completion of subsequent data collection, I was able to examine the differences between two groups of snorkelers: those that had received no interpretation (pre-workshop, n=100) and those that had received interpretation (post-workshop, n=104). Those snorkelers who had received interpretation displayed more pro-environmental snorkel behavior and were generally more satisfied with specific aspects of the snorkel excursion (increased visitor experience). These results indicate a successful interpretive program based on salient beliefs and targeted by interpretive efforts. Interpretive efforts that incorporate behavior (change) theory can be effective in promoting pro-environmental snorkel behavior.

In the final component I examined whether the interpretation resulted in long-term belief changes, beyond the short-term changes in snorkel behavior (Chapter 5). Six to 14 months following their snorkel excursion, 167 participants were emailed a web questionnaire that contained questions the participants had completed prior to their snorkel excursion, regarding their behavioral intentions, control beliefs, and behavioral beliefs. Most of the beliefs had not been altered over the six-month period. According to the Elaboration Likelihood Model, which holds that the type of behavior change (short- or long-term) depends on the amount of elaboration, the interpretation received by the participants was not sufficient to create long-term behavior (belief) change.

When using interpretive interventions to change the potentially damaging behavior of visitors to natural resources, it is essential that the target behavior is volitional and open to interpretive efforts. By investigating the potentially damaging behavior of marine resource users, paired with an understanding of behavior theory, this study has shown that directed interpretation, based on the salient beliefs of visitors, can be considered an effective management tool in the protection and preservation of marine resources. The theoretical framework, incorporating behavior theory (the Theory of Planned Behavior) and communication theory (the Elaboration Likelihood Model), was effective in explaining the degree of influence, and its limitations, that interpretation had on snorkeling and diving behavior. In particular, it guided the use of salient beliefs in designing an interpretation program, and also explained the limited efficacy of this program in affecting short-term behavior but not long-term beliefs. Future research should focus efforts on understanding how interpretive efforts can most effectively target salient beliefs to realize long-term changes of behavior. This would result in benefits of interpretation extending from the local area to larger scale (in space and time) resource protection.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction, Literature Review, Research Questions, Study Site and Thesis Layout

1.1. Introduction

Scuba diving and snorkeling are popular recreational activities on coral reefs throughout the world, especially in marine protected areas due to the protection afforded to the marine environment (Harriott et al., 1997, Luna et al., 2009, Davis and Tisdell, 1995). People travel extensively to remote locations to enjoy the pristine state of the marine resources, interact with marine life and enjoy the diversity coral reefs offer (Inglis et al., 1999). This interest has led to the establishment of numerous nature-based tourism businesses throughout the world's oceans paired with increased accessibility to these operations (Hawkins and Roberts, 1993). This recreational activity, when combined with pressures such as climate change, declining water quality, eutrophication, introduction of alien species and over harvesting of fish species, threatens these marine resources (Birtles et al., 2010, Hoegh-Guldberg et al., 2007, Hughes et al., 2010, Wilkinson, 1996).

One of these recreational pressures is scuba diver/snorkeler impact on the coral reef substrate. Even if resource use is thought to be minimal, impacts will still occur (Marion and Reid, 2007, Madin and Fenton, 2004, Leung and Marion, 2000, Hammitt and Cole, 1998). Impacts may include coral breakages, sedimentation of coral reefs, harassment of marine life, and/or trampling of the reef substrate (for example: Rouphael and Inglis 1997, Hawkins, Roberts et al. 1999, Plathong, Inglis et al. 2000, Barker and Roberts 2004, Dearden, Bennett et al. 2007, Luna, Perez et al. 2009). Various authors have indicated that direct contacts with coral are the most frequent and damaging types of impacts made by scuba divers (Walters and Samways, 2001, Barker and Roberts, 2004, Medio et al., 1997). Although some coral contacts may be an expected and unavoidable dimension of coral reef recreation, many of these types of impacts could be a result of volitional behavior (under the complete control) of the scuba diver/snorkeler and therefore responsive to management intervention. As nature-based tourism is steadily increasing within the tourism industry (Buckley, 2000, Madin and Fenton, 2004, Orams, 1996a, Garrod, 2008), both resources and resource users must be well managed (Marion and Rogers, 1994, Hammitt and Cole, 1998), and this also applies to recreational marine resource use (Dearden et al., 2007, Young and Loomis, 2010).

Managing the impacts of resource users can be achieved by: 1) physically restricting where visitors can go; 2) creating rules and regulations about what visitors can and cannot do; 3) imposing entrance fees and/or fines on visitors; and 4) raising awareness of the visitors through interpretation (Orams, 1996a). The fourth option has received the least amount of attention, yet has great potential in influencing the behavior of resource users and thereby contributing to resource management (Orams, 1996a, Scott-Ireton, 2008, Worachananant et al., 2008). Interpretation is not just the provision of factual information, but rather it provides informed communications that provoke the audience to think (Zeppel and Muloin, 2008, Luck, 2003, Moscardo, 1998, Moscardo, 1996, Orams, 1996b). Interpretation then further provides opportunities for the audience to use the information they have been given, and are offered guidance in applying this information. Interpretation has been shown to influence behavior effectively into pro-environmental behavior (Mayes and Richins, 2008, Orams and Hill, 1998, Madin and Fenton, 2004, Moscardo et al., 2004, Zeppel and Muloin, 2008, Luck, 2003, Roggenbuck, 1992). Throughout this thesis pro-environmental behavior will refer to any actions that have a neutral impact on the surrounding environment. It has been argued that the most effective delivery of interpretation is through the use of guides who accompany the excursion, as guides offer personal interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003, Luck, 2003), however, more research is needed to validate this (Moscardo et al., 2004, Anderson et al., 2003). Effective interpretation, delivered by guides or other media, will deliver messages that appeal to the audience and stimulate thoughts about the messages.

Few studies exist that have investigated the use of interpretation in minimizing the negative impacts created by recreational marine resource users (Table 1.1). Furthermore, numerous other studies on the management of scuba divers have expressed a need for more effective use of pre-dive briefings (Barker and Roberts, 2004, Camp and Fraser, 2012, Lucrezi et al., 2013b). Certification agencies such PADI, NAUI and SSI have implemented environmental education programs into their instructional materials but these programs suffer from “incompleteness of environmental messages and the lack of clarity or standardization in the delivery of key points (Johansen and Koster, 2012, Lindgren et al., 2008, Pepe, 2010). Therefore more work is required to improve educational materials.” (Quoted in Lucrezi, 2013 p. 60).

Table 1.1. Studies examining the effects of interpretation on minimizing impacts.

Study and Geographic Region	Audience	Method of Interpretation	Result of Interpretation
Medio, Ormond et al. 1997, The Red Sea	Scuba divers	Extended briefing to minimize impact	Significantly fewer contacts as result of the extended briefing
Barker and Roberts 2004, Caribbean Sea	Scuba divers	Short briefing and dive guide intervention to minimize impacts	Briefing had no influence on behavior but dive guide intervention reduced contacts
Luna, Perez et al. 2009, Mediterranean Sea	Scuba divers	Short briefing to minimize impact	Significantly fewer contacts as result of the briefing
Plathong, Inglis et al. 2000, Great Barrier Reef	Snorkelers	Signage on self guided trails to minimize impact	Increased coral damage near the signage

Barker and Roberts (2004) found that the provision of a pre-dive, verbal briefing was not sufficient to minimize negative impacts while Luna et al. (2009) found the opposite. Medio et al. (1997) found that extended briefings were able to minimize impacts. Plathong et al. (2000) conducted a study of snorkelers and snorkeler damage along a self-guided snorkel trail. Trail signs were placed throughout the snorkel trail portraying information aimed at the snorkelers. The study found that most damage of the coral substrate occurred in the immediate vicinity of the snorkel trail signs as snorkelers were attempting to read the trail signs. More conclusive research is needed to understand what is needed to create an effective interpretation program aimed at scuba divers and snorkelers to minimize their impacts (Barker and Roberts, 2004, Camp and Fraser, 2012).

Previous research on scuba divers has examined scuba divers' environmental awareness, attitudes and (social) norms and their relation to the conservation of the marine resources (Leujak and Ormond, 2007, Needham, 2010, Ong and Musa, 2012, Anderson and Loomis, 2011, Musa et al., 2011). These studies investigated the relationships between experience and marine knowledge on the one hand and resultant attitude and behavior on the other. Further studies (Camp and Fraser, 2012, Di Franco et al., 2009) measured the actual observed behavior paired with a post-activity questionnaire that gathered data on awareness. Although each study has contributed to the understanding of scuba diver behavior, their contributions have been focused on isolated aspects of the bigger picture: influencing behavior by identifying the key drivers that determine behavior. Furthermore, their reliance on self-report behavior data by the participants is a limiting factor to the validity of the actual behavior. Studies on the hypothetical relationships between scuba diver motivations, preferences and experience compared to behavior, norms and perceptions have also been conducted (Uyarra et al., 2009, Coghlan, 2012, Thapa et al., 2005, Szuster et al., 2011), however, these studies also relied on self-report behavior data, or did not use any behavior measures. Regardless of the limitations of the afore research, studies on topics involving marine resource users is still rare in current literature (Lucrezi et al., 2013a).

As mentioned previously, one type of impact recreational scuba divers and snorkelers can have is contacting the (living) reef substrate. To determine where interpretive efforts will be most effective, research must be completed that examines this scuba diving/snorkeling behavior. This research should describe the scuba diving/snorkeling behavior of the resource users to identify the damaging types of behaviors and to indicate when during a scuba diving/snorkeling activity they occur. The drivers that influence behavior should be identified so that these can be targeted. This research may then indicate where and when these interpretive efforts could be focused.

More research is needed to determine the critical components of effective interpretation. Interpretation must appeal to visitors so that they exhibit more pro-environmental behavior. Thus, an understanding of behavior theory, and the drivers that determine the resultant behavior, are essential (Orams, 1996b, Marion and Reid, 2007, Stern, 2005, Petty et al., 1992, Madin and Fenton, 2004). This need has been well documented by numerous authors in various studies (for example: Orams 1994, Orams 1996, Cole, Hammond et al. 1997, Beaumont1998, Tanner 1999), and has been apparent for several decades (Olson, 1984). Creating interpretation aimed at influencing the behavior of scuba divers and snorkelers so that they do not touch the living reef will be ineffective if the message of the interpretive efforts does not appeal to the audience. An understanding of behavior theory can assist in discovering the salient beliefs (Ham et al., 2009), or those important and dominating beliefs that are very influential in resultant behavior, that appeal to the audience, and furthermore, it will assist in the creation and delivery of the interpretive efforts.

Interpretation can potentially be effectively used to influence behavior such as contacting the living reef. The interaction between visitors and a particular resource and/or demonstrating pro-environmental behavior has been the focus of numerous terrestrial (in this thesis terrestrial will refer to non-marine) studies. Very few studies exist in the domain of marine recreational resource use (Zeppel, 2008, Lucrezi et al., 2013a). Most conservation efforts aimed at marine resources have not been through the use of interpretation programs but through biological research such as: examining species diversity; spill-over effects; biomass; and nursery areas (Russ and Alcala, 1996, Juanes, 2001, McClanahan and Mangi, 2001, Roberts et al., 2001, Russ et al., 2003, McClanahan et al., 2005). Furthermore, many studies have also investigated the impacts of scuba divers and snorkelers but these have been descriptive studies focusing only on the impacts (Allison, 1996, Hawkins et al., 1999, Barker and Roberts, 2004, Harriott et al., 1997, Rouphael and Inglis, 1997, Luna et al., 2009, Plathong et al., 2000, Talge, 1992, Tratalos and Austin, 2001). Marine interpretation programs that do exist have predominantly focused on ‘exciting’ marine life such as whales, dolphins, dugongs, sharks, turtles and birds (Orams and Hill, 1998, Luck, 2003). However, Moscardo et al. (2004) point out: “a growing area of interest lies in the interpretation of the least popular animals” (p. 241). This statement is supported by findings of Glickman (1995) and Woods (Woods, 2000). Lucrezi (2013a) adds that species which are part of marketing campaigns attract numerous divers (Anderson and Loomis, 2011, Curtin and Garrod, 2008, Musa et al., 2006) and as divers gain in experience they begin to seek out the less popular, smaller, cryptic species (Cater, 2008, Dimmock, 2009). ‘Non-exciting’ marine resource use continues to lag behind the ‘exciting’ resource use. ‘Non-exciting’ would imply that interpretation could also be effective in areas that do not have an abundance of ‘exciting’ wildlife. Interpretive efforts need to discover the appropriate messages for the intended audience.

The few studies that have used behavioral research to create an interpretation program have most often measured the intent to act, rather than the actual behavior (Zeppel, 2008), or relied on self-reporting of behavior, which is known not to be an accurate representation of actual behavior (Wicker, 1971, Wicker, 1969, Bickman, 1972, Deutscher, 1973, Chase and Harada, 1984, Robertson, 1986, Hines et al., 1986, Hendee et al., 1990, Finger, 1994, Bogner, 1998, Howard, 1999, Zelezny, 1999, Gralton et al., 2004). Zeppel states that more long-term studies are necessary to measure behavior change (see Zeppel 2008 for a list of studies).

In conclusion, an understanding of behavior psychology is essential to create effective interpretation. This interpretation can target behavior such as contacting the reef substrate. The salient beliefs must first be identified and then targeted throughout the interpretive program and/or efforts. Successful interpretation will also enhance visitor enjoyment, which is an important stimulant in adopting changed behavior practices. If interpretive efforts lead to increased thinking about certain issues then behavior change can have long-lasting effects. Furthermore, research exploring the use of interpretation should use actual behavior rather than self-reported behavior to validate any changes in behavior.

The overarching research questions for this project are: “What are the drivers that influence behavior?” and “how can interpretation be used to influence recreational marine resource users to act in a more environmentally-responsible manner during interactions with coral reefs?”

These research questions will be addressed by monitoring scuba divers and snorkelers during scuba diving/snorkeling excursions in the Mombasa Marine Park and Reserve, Kenya. The scuba diving/snorkeling behavior of the divers/snorkelers will be described to determine potentially damaging contacts to the reef substrate these resource users could inflict, and the various drivers that can influence behavior of these resource users will be investigated. The salient beliefs of these resource users will then be identified to enable the creation of interpretive efforts aimed at managing the potentially damaging contacts inflicted on the reef by the resource users. Interpretive efforts aimed at snorkelers will then be tested to determine the efficacy of the efforts and if these efforts have long-lasting outcomes. The next section (1.2 *Literature Review*) will illustrate the theoretical background used to formulate the specific research questions of this research project. Sections 1.3 and 1.4 will therefore conclude with the more specific research questions and a detailed outline of the thesis. Section 1.5 will describe the study site.

1.2. Literature Review

1.2.1. Overview of the Literature Review

The *Literature Review* will outline the theoretical background and essential concepts necessary to introduce the specific research questions. Understanding the drivers that influence behavior is an important step in creating pro-environmental behavior leading to the management of visitor impacts. The *Literature Review* will illustrate how recreational (marine) resource use creates impacts and that these impacts can be detrimental to the (reef) environment. This degradation of the environment thus creates a need for the management of these impacts, achievable through the use of interpretation. Interpretive efforts also have the ability to enhance visitor experience, which in turn assists with management efforts. The *Literature Review* also discusses the theoretical frameworks applied throughout this research project. The final sections (1.3, 1.4 and 1.5) of this chapter detail the specific research questions, the thesis layout and the study site.

1.2.2. Theoretical Background

Recreational Resource Use and Impacts

Hammitt and Cole (1998) define recreation as an activity that "offers a contrast to work-related activities and that offers the possibility of constructive, restorative and pleasurable benefits" (p.3). People engage in these activities for a multitude of reasons that include, but are not limited to the following: relaxation, socialization, challenge, and excitement (Orams, 2000). Recreational resource use is further defined when these activities depend upon the natural resources of the areas in which they are used. Recreational resource use is a global activity enjoyed by many people in a variety of settings including terrestrial (hiking, camping, vehicle motoring, fishing, etc.) and/or marine (snorkeling, sailing, scuba diving, boat motoring, fishing, etc.). Hammitt and Cole (1998) summarize the reasoning for resource use below:

> (1) visitors engage in different activities for different reasons and in different ways, (2) visitors participate in the same activities for different reasons, and (3) they utilize recreational environments in different ways to achieve the experiences they desire (p. 178).

How natural resources are used for recreation depends on the physical quality of the resource (Bramley and Carter, 1992). If the resource is of desirable quality (desirable in this case can be very subjective depending on the resource user: fishermen would prefer areas with an abundance of fish, outdoor hikers would prefer an area of solitude and stunning landscapes etc.)

then that resource will be exposed to more resource use, and this in turn is a major factor determining the amount of impact that the resource receives (Hammitt and Cole, 1998). Lucas (1979) explained that the term ‘impact’ is a neutral term since impact can be positive or negative. Society has placed upon this term a value judgment when referring to ecological impacts implying, “an undesirable change in environmental conditions” (Hammitt and Cole 1998, p. 6), thus impact is usually implied to be negative. When people use resources they create impacts (Bramley and Carter, 1992, Kimmel, 1999, Madin and Fenton, 2004), even if the resource use is minimal (Hammitt and Cole, 1998, Leung and Marion, 2000, Marion and Reid, 2007). Impacts may be obvious such as cutting down trees for bush fires; trampling of wilderness paths; pitching tents on delicate substrate; or perhaps more subtle such as intimidating wildlife; interacting with local cultures; or touching living organisms (such as corals).

Marine resources suffer from many threats: unsustainable fishing; pest plants/animals and disease; dredging; oil and gas extraction; mariculture; climate change; and recreational use (Lockwood et al., 2006). Marine recreation in particular has a wide and varied level of impact upon the marine resource as described in numerous studies (e.g., Harriott, Davis et al. 1997, Hawkins, Roberts et al. 1999, Luna, Perez et al. 2009). Examples from these studies include: snorkel damage; scuba diver damage; trampling; crowding; fish-feeding; boat anchoring; destructive fishing; and physical contact with aquatic wildlife. These negative impacts may be exacerbated when an increased demand is placed on these resources through unsustainable practices (Lucrezi et al., 2013a, Musa, 2002, Zakai and Chadwick-Furman, 2002). Bramley and Carter (1992) believe that if (recreational) resource use is adequately structured the end result would be a neutral (or positive) impact, and (recreational) resource users will demonstrate pro-environmental behavior. Pro-environmental behavior throughout this thesis is defined as any scuba dive/snorkel behavior that does not create negative impacts on the environment and consists of scuba dive/snorkel behavior that promotes the conservation and preservation of the resources and environment.

Terrestrial and marine recreational resource uses are quite different. For example, marine resource users usually have greater freedom to disperse over the entire physical resource whereas terrestrial resource users usually stay within specified trails or tracks due to physical boundaries (Salm, 1986, Marion and Rogers, 1994, Plathong et al., 2000). Unlike marine resources, terrestrial resources have clear physical boundaries (Agardy, 2000). From the viewpoint of the biological organisms inhabiting terrestrial and marine resources there are also some differences: mobile versus sessile lifestyles, size, growth rates and trophic position relations as different food chains are affected in different ways (Carr et al., 2003, Lockwood et al., 2006). These differences result in different methods of managing the resources and often the underlying recipe for terrestrial management cannot automatically be applied to the management of marine resources (Marion and Rogers, 1994, Agardy, 2000). The same holds true for the types of visitor behavior that occur in each type of area, and also in any resultant approaches to managing this behavior.

Environmental Behavior

Hungerford and Volk (1990) described an environmentally responsible citizen as one who has:

> (1) an awareness of the environment; (2) basic understanding of the environment; (3) feelings of concern for the environment; (4) skills for identifying and solving environmental problems; and (5) active involvement in all levels of environmental problems (p. 9).

The obvious question one consequently asks is: 'how do we get people to behave in such environmentally responsible ways?' Behavior is commonly referred to as one's actions, or inactions, toward someone, something and/or some object (to include resources, ideas, morals, etc.). Recreation user's actions that result in inappropriate behavior, or behavior that has been termed 'undesirable,' have been classified as: 'careless, unskilled, uninformed, unavoidable and illegal' (Hendee and Dawson, 2002, Manning, 2003, Marion and Reid, 2007). Various authors state that behavior creating negative impacts to recreational resources does not usually stem from malicious acts, but rather a lack of knowledge is to blame (Hendee et al., 1978, Olson, 1984, Marion and Reid, 2007). Marion and Reid (2007) believe that education (or interpretation) programs can effectively target behavior resulting from 'unskilled' and 'uninformed' actions and to a lesser extent those resulting from 'careless' actions. Reasons for this belief are that these types of behaviors are more related to the knowledge levels and the skill capabilities of the recreational resource users (Roggenbuck, 1992, Hendee and Dawson, 2002, Manning, 2003, Marion and Reid, 2007).

Environmental interpretation is a tool that can be used to reduce inappropriate behavior. Numerous authors have justified environmental interpretation in a variety of studies (Forestell, 1990, Newhouse, 1990, Jacobson and Marynowski, 1997, Tanner, 1999, Ballantyne and Packer, 2005, Manning, 2003). Some authors argue that interpretation is an integral component of tourism (Orams, 1997, Luck, 2003) that can even result in 'more desirable ecotourists' (Orams, 1995, Orams, 1996a). Educational psychology has been researched thoroughly, however, little of this has been put to use in the environmental interpretation and management field (Orams, 1994) despite its obvious importance (McKenzie-Mohr, 2000). Understanding behavior theory is paramount to the efficacy of interpretation programs in prompting behavior change to assist with resource protection and conservation (Petty et al., 1992, Orams, 1997, Hammitt and Cole, 1998, Darnton, 2008). Effective interpretation programs target specific mental processes for behavior change (Orams, 1996b, Orams, 1994). Unfortunately little research has been completed to demonstrate explicit links between environmental awareness as a result of interpretation and behavior change (Tanner, 1999, Beaumont, 1998, Cole et al., 1997, Orams, 1996a). This gap has been apparent for several decades (Olson, 1984).

Interpretation as a Tool to Manage Resource Use

What is Interpretation

Numerous authors have defined interpretation but the most commonly used definition was developed by Tilden in 1957:

> an educational activity which aims to reveal meanings and relationships through the use of original objects, by first hand experience, and by illustrative media, rather than simply to communicate factual information (p. 8).

Tilden continues to expand on this: “an educational activity which aims to reveal meanings and relationships,” as an “art” and as “revelation based upon information” (p. 3-9). Alderson and Low (1985) offer more recent definitions of interpretation: “interpretation is a planned effort to create for the visitor an understanding of the history and significance of events, people and objects with which the site is associated” (Alderson and Low quoted in Moscardo 1998, p. 3). Moscardo (1996) defines interpretation in a resource use context by stating that interpretation must:

> educate tourists about the nature of the host region and culture, inform them of the consequences of their actions, enhance their experience and encourage them to engage in sustainable behaviors (p. 378).

The Society for Interpreting Britain’s Heritage (1998) summarize with interpretation as: “the process of communicating to people the significance of a place or object so that they enjoy it more, understand their heritage and environment better; and develop a positive attitude toward conservation” (quoted in Moscardo 1999 p. 8). From these definitions it becomes clear that interpretation is a communication process, and more precisely, a persuasive communication process that can be applied to resource use activities (Society for Interpreting Britain's Heritage, 1998, Moscardo et al., 2004).

The Process of Interpretation

The process of interpretation is designed to make the recipient aware of meanings and relationships between them and the natural environment, and also stimulate interest and enthusiasm (Moscardo and Pearce, 1986, Luck, 2003). Interpretation often includes first-hand experiences with natural environments (Zeppel, 2008), and it, “assists the visitor to appreciate the area” (Weiler and Davis 1993, quoted in Luck 2003 p.943). Interpretation programs use a variety of ways to get a message across to an audience, examples include: signs, guides, trails, brochures, and visitor centers (Zeppel, 2008). Guides (people who do the guiding) in particular have often been praised as the best method of interpretation as they deliver a very personal interpretation (Aiello, 1998, Moscardo et al., 2004). Guides can demonstrate role-model behavior, manage visitor-wildlife interactions and enforce minimal impact behavior (Moscardo et al., 2004). The most common type of interpretive tool is the use of signs (Moscardo et al., 2004). Most interpretation programs use a variety of tools to deliver the message(s). The ambient settings will dictate which tool or combination of tools will work best for that particular area (Moscardo et al., 2004).

Interpretation includes the delivery of information, however, information alone is not enough to prompt behavior change. The assumption that the provision of information alone is sufficient to change behavior has been widely disproven by numerous studies (e.g. Hungerford and Volk 1990, Ballantyne and Packer 2005, Stern 2005). Rather, information is one of the necessary components that contribute to effective interpretation (Orams 1996, Moscardo et al. 2004, Ham 2007, Zeppel and Mouloin 2008). Forestell (1993) mentions, “knowledge without behavior leaves no discernable trace of change. In the long run, behavior without knowledge will only last until the next fad” (p. 277). Tilden (1977) states that the aim of interpretation is, “not instruction but provocation” (p. 9), a belief shared by other researchers as well (Moscardo, 1996, Hammitt, 1984, Pastorelli, 1998, Ham, 2007). Besides information, interpretation programs must also include the following attributes to be effective as a management tool in resource use activities: stimulate interest, promote learning, guide resource users in appropriate behavior and encourage enjoyment. Interpretation programs that include all these characteristics can influence visitor attitudes and behavior, and result in changes to both (Roggenbuck, 1992, Luck, 2003, Moscardo et al., 2004, Mayes and Richins, 2008, Zeppel, 2008). The resultant influence of successful interpretation can then have one of three outcomes: change existing attitudes, reinforce existing attitudes or create a new attitude towards a particular behavior (Ham, 2007).

Interpretation as a Management Tool

A consistent theme expressed by numerous authors is that the success of resource management is closely linked to an increase in awareness by the recreational resource users (Kerr, 1991, Orams, 1996b, Orams, 1996a, Hammitt and Cole, 1998, Agardy, 2000, Carr, 2000, Young and Temperton, 2008). This need was already apparent more than two decades ago (Olson, 1984).

Awareness can be defined as: “having knowledge of” (Swannell, 1983) and can best be delivered through nature interpretation (Alcock, 1991). Environmental interpretation for natural recreational resource management seeks to increase visitor knowledge and awareness (to include knowledge about problems and solutions that can prevent or solve those problems) with the ultimate aim being a reduction of inappropriate behavior. The use of interpretation to reduce negative behavior has been justified in a variety of studies (Forestell, 1990, Newhouse, 1990, Jacobson and Marynowski, 1997, Tanner, 1999, Manning, 2003, Ballantyne and Packer, 2005). The knowledge gained from such interpretive programs will guide the recreational visitor to interact with the natural resources in a sustainable manner.

Some authors believe that interpretation is an important management tool to influence visitor behavior and reduce inappropriate behavior (Aiello, 1998, Howard, 2000, Ballantyne and Packer, 2005, Orams, 1996b), and therefore is an integral component of tourism (Orams, 1997, Luck, 2003). Environmental interpretation is often viewed as the most effective management strategy for tourist-wildlife interactions (Alcock, 1991, Howard, 2000), since environmental interpretation has been used to change attitudes and behavior. An environmental interpretation program should target the values and beliefs held by the recipients, as this is what often determines or drives behavior (Ham and Krumpe, 1996, Pastorelli, 1998, Ham, 2007). The creation of new attitudes and behavior is the aim of interpretation (Forestell, 1990, Orams, 1996b, Pastorelli, 1998, Ham, 2007). Some of these attitude and behavior changes can translate into off-site pro-conservation efforts as well (Orams, 1997, Zeppel, 2008, Zeppel and Muloin, 2008) and/or long-term behavior change benefits (Mayes and Richins, 2008, Zeppel, 2008). Examples of long-term behavior change can include but are not limited to: donating money, minimizing environmental impacts and supporting environmental issues (Moscardo et al., 2004).

Effectiveness of Interpretation

Interpretation programs already exist in numerous (marine) protected areas but few have been evaluated for effectiveness and a need exists for further research into the role that these interpretation programs play (Orams, 1997, Luck, 2003, Pomeroy et al., 2004). Most interpretation programs aimed at changing behavior have been information-based (media advertising and supply of printed materials) and have two underlying assumptions: (1) information will enhance knowledge and influence attitudes resulting in behavior change (widely disproven as outlined earlier) and (2) economic motives (McKenzie-Mohr, 2000). This second assumption refers to a person adopting a changed behavior once it becomes clear that the person can gain financially from the changed behavior (e.g., energy efficient devices such as low-flow showerheads, low-flow toilets). Various case studies have shown that creating economic motives does not necessarily result in changed behavior (McKenzie-Mohr, 2000). Natural resources used by recreational resource users provide enticing opportunities for learning about natural resources. To quote Jacobson (1990): “parks have been called our greatest classrooms without walls” (p. 25) and these classrooms want to be filled (Aiello, 1998, Luck, 2003). However, to be effective, interpretive programs require careful design and implementation. An understanding of the learning process and underlying behavior theory is crucial so that interpretation campaigns can be directed in an effective, enticing and efficient manner (Orams, 1994, Orams, 1997, Tanner, 1999, Darnton, 2008, Orams, 1996b).

To use interpretation effectively, the salient beliefs that drive a recreational resource user’s behavior must be targeted. Behavior theories (such as TPB, see section 1.2.3 on Behavior and Behavior Change below) can assist in identifying these salient beliefs while behavior change theories (such as ELM, see section 1.2.3) can assist in guiding interpretive efforts and ensuring that these underlying beliefs have been altered, thereby influencing or altering the behavior (Ham et al., 2009). Behavior theory must be included when designing interpretive efforts aimed at managing resources. However, little of this has been put to use in the design of interpretation (Orams, 1994), despite its obvious importance (McKenzie-Mohr, 2000). Examples that have targeted salient beliefs with a successful behavior change outcome include studies on reducing household energy consumption (Schultz et al., 2007), removing litter from national parks, staying on tracks in national parks and not feeding animals in national parks (Ham et al., 2009).

Delivery of Interpretation

Many marine recreational activities, such as scuba diving and snorkeling, are often conducted in the presence of a guide (a person guiding the resource users). The best method of interpretation has often been attributed to guides as they deliver a very personal interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Luck, 2003, Aiello, 1998). Guides tend to act as motivators in getting visitors to respect wildlife or adopt pro-environmental practices (Skanavis and Giannoulis, 2009, Zeppel, 2008, Zeppel and Muloin, 2008, Black and Ham, 2005). Furthermore, attributes such as the ability to demonstrate role-model behavior, manage visitor-wildlife interactions and enforce minimal impact behavior make guides properly and best placed to deliver interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003). Littlefair (2003) summarizes: “guides can influence visitors through two key avenues: role-modeling of appropriate behaviors; and the education they provide to the group through interpretation” (p28).

Herein interpretation, in a resource use context, is a term that encompasses informal education, media, signage, brochures, personnel interaction and any other form of information transfer. Furthermore, any of these interpretive efforts should aim to create curiosity, promote awareness and reveal meanings and relationships between the resource user and the natural resources. Interpretation is the vital link between the recreational resource user and the natural resource (Orams, 1996b), as an informed user group may offer less inappropriate behavior and therefore increase the protection of resources (Forestell, 1990, Madin and Fenton, 2004).

In conclusion, interpretation can be delivered in a variety of forms but the underlying goal is to increase the motivation of the recreational resource user to be more environmentally responsible. This is achieved by creating curiosity, promoting awareness and by engaging in sustainable interactions with the natural resources. Interpretation supplies the recreational resource user with adequate information concerning the problems, solutions and surrounding facts that can then be used when he/she decides on how to interact with that resource. Information provided by the interpretive program should build on the salient beliefs of the recreational resource user. If an interpretive program does not build on, or target the salient beliefs of the resource user, the interpretive program is unlikely to appeal to the recreational resource user and no behavior change will occur. Interpretation, if effective, changes recreational resource user behavior into pro-environmental behavior (Orams, 1996b, Jacobson and Marynowski, 1997, Ballantyne and Packer, 2005). Interpretation has also been shown to be effective in increasing visitor enjoyment (see next section) (Weiler and Davis, 1993, Orams, 1996b, Luck, 2003). Both reasons are of paramount importance as tourism, and more specifically nature-based tourism, is increasing in numbers (Orams, 1996a, Buckley, 2000, Madin and Fenton, 2004). Finally, studies have shown that recreational resource users are receptive to interpretation and furthermore exhibit a desire to increase their understanding of the environment through the acquisition of information (Luck, 2003). Moscardo concludes: “an important role for interpretation in sustainable wildlife tourism is to inform visitors of the consequences of certain behaviors and to provide education to encourage minimal impacts” (Moscardo et al. 2004, p. 232). Furthermore, interpretation should invoke curiosity, excitement and positive experiences.

Visitor Experience

To determine the efficacy of interpretation in resource management, one can measure various aspects of visitor experience. The quality of recreational experiences is an important measure by which to gauge the efficacy of resource management. Interpretation can also enhance visitor enjoyment (Alcock, 1991). Moscardo (1996) states: “interpretation is the key to ensuring the quality of the tourist experience" (p. 376). Enjoyment of an interpretive program by itself has been shown to create a positive attitude change and acceptance of pro-environmental behavior or resource management philosophy (Moscardo, 1999, Moscardo et al., 2004). The positive attitude change can only occur if the salient beliefs of the recreational resource user are targeted in interpretive efforts. Interpretation therefore contributes to sustainable resource use through positive and enjoyable experiences. Numerous authors agree that interpretation is crucial in creating a positive experience for recreational resource users yet research is lacking regarding the details of this aspect of interpretation (i.e. interpretation design, type of interpretation, delivery; Glaspell et al. 2003, Moscardo et al. 2004, Wearing et al. 2008).

Effective resource management relies on visitor experiences being measured. Higham and Carr (2003) completed an analysis of visitor experiences in New Zealand and concluded that the provision of a variety of wildlife or ecosystem experiences enhanced the overall experience of the visitor. Furthermore, they found that the visitors: "considered the delivery of effective visitor interpretation to be a critical aspect of sustainable wildlife tourism" (Higham and Carr 2003, p. 29). Measuring visitor experience will also provide meaningful insights into what should be avoided, or controlled in a resource use setting. For example, Archer and Griffin (2004) completed a study at Barrington Tops National Park, Australia, examining visitor satisfaction. The study indicated that the greatest influence on visitor enjoyment was anti-social behavior by other visitors. Similar findings were also confirmed by Rogenbuck in his study of wilderness conditions in the central United States (1993), and by Shafer and Hammitt (1995) in a similar study in the United States. Anti-social behavior was defined as unruly behavior, littering, and/or noisy people.

Numerous different factors may influence a person's nature-based experience. Shafer et al. (1998) state that in a coral reef environment the conditions that determine visitor experience are a result of natural (corals, fish), social (number of people and their actions, and/or boats), managerial (rule and regulations) and physical (weather) components of the resource. In their study of visitor experiences to the Great Barrier Reef, Shafer et al. (1998) found that the natural conditions had the biggest influence on visitor enjoyment, and this was mirrored by Higham and Carr in New Zealand (2002). Shafer et al. also discovered that visitor experiences on large-scale operations (300-450 passengers) differed to those on small-scale operations (up to 50 passengers) with regard to benefits (about nature, escape and family) received and how certain conditions (relating to coral, fish and operator staff) added/detracted to their enjoyment (Shafer and Inglis, 2000). Bramley and Carter (1992) state that the physical condition of the environment is the most important factor for visitors. Several studies have shown that proper training and knowledge of the interpretive guides strongly improved visitor satisfaction (Luck, 2003). A study in Botswana on guide-visitor relations confirmed the opposite: the tour guide's lack of knowledge was the main reason for visitor dissatisfaction to the Moremi Wildlife Reserve (Almagor, 1985). Challenge is an element of interpretation that appears to be very important in determining the visitor experience. More visitors had an enjoyable experience after they were challenged by the interpretive program (Higham and Carr, 2002). When attitudes regarding environmental issues are challenged, and visitors are forced to think about the issue, pro-environmental attitudes can be fostered (Higham and Carr, 2002). Ham (2003) even refers to the challenge aspect as the first thing that must be accomplished in an interpretive program. However, visitors will only think about issues they are made aware of if the message appeals to them, and this again can be achieved by utilizing the salient beliefs underlying the behavioral beliefs (attitudes), normative beliefs (norms) and/or control beliefs (perceived control).

Higham and Carr (2002) completed a study on visitor experiences of interpretation programs in New Zealand and were able to describe five aspects of a visitor experience that were important in determining the experience. The five aspects were as follows: (1) non-specific focus of visitor experience, (2) ecological interpretation, (3) human impacts, (4) conservation advocacy and (5) environmental issues. The first aspect states that a diversity of informative focus must be available. For example, Higham and Carr (2002) found that interpretive programs focusing on a single species (a dolphin program) but added information regarding other non-related species (birds in this case) created more visitor satisfaction compared to only providing information on the focus species (dolphins). The second aspect, ecological interpretation, states that interpretive programs should attempt to create an all-encompassing program that includes all aspects of the ecosystem. Again, such programs were found to create an increase in visitor enjoyment. "Human impacts should also be integrated into ecological interpretation" (Higham and Carr 2002, p. 288) with detailed examples of past, present, and future actions. Those operations that Higham and Carr (2002) studied that had made a commitment to the environment (conservation advocacy) were found to have a strong influence on the visitor experience. The last aspect states that current environmental issues on a local, regional, national and/or global scale are implemented into the program.

The ability to measure visitor experience (satisfaction or enjoyment) is one measure that can be used to determine if interpretation is effective, which in turn determines the effective management of resources (Wearing et al., 2008). Oftentimes managers have chosen to examine measures that were examined elsewhere (in different settings with different variables acting upon those settings) due to their lack of understanding of how specific factors influence visitors (and visitor experience) in their specific resource area (Glaspell et al., 2003). Recreational resource users in different areas will have different underlying beliefs towards a particular behavior and having discovered these beliefs in one area is no guarantee that they are similar in a different setting. As Shafer et al. (1998) summarize: “different settings provide different experiences” (p. 12). Every resource area is different, as is every visitor to that specific resource area (Wearing et al., 2008) and this must be accounted for when determining which factors to examine to determine visitor experience. “Different settings are likely to require that different indicator conditions be selected or that different standards be set for the same indicator conditions” (Shafer, Inglis et al. 1998, p. 12).

1.2.3. Theoretical Frameworks Applied

This section outlines the theoretical frameworks used during this research project. This section explains the Theory of Planned Behavior (TPB), the Elaboration Likelihood Model (ELM) and the TORE™ model of persuasive communication. The Theory of Planned Behavior provides the behavior model that indicates which components of behavior need to be targeted in order to influence behavior. The Elaboration Likelihood Model is a framework that guides how these components are best targeted. The TORE™ model then combines TPB, ELM and interpretive efforts to achieve behavior change. Being familiar with these frameworks, and the previous sections of the *Literature Review*, is necessary to understand not only how the research questions were derived, but also how the researcher went about answering these questions. This section also introduces the theoretical framework developed by the researcher that ties these individual theories together to guide this research project.

Drivers of Behavior

To create a management intervention aimed at reducing the impacts of scuba diving and snorkeling one must first understand the factors that drive the potentially damaging behavior of users engaged in those recreational activities. This understanding can then be used to influence the behavior into more pro-environmental behavior. Of particular importance is whether the potentially damaging behavior is under volitional control (i.e. whether damaging actions are the result of choices individual users make), and if so, what variables influence those choices. A review of the literature has revealed the following classes of factors that can influence the behavior of scuba divers and snorkelers: personal factors (e.g., experience level, skill level), environmental factors (e.g., visibility, current) and situational factors (e.g., shore vs. boat dive, carrying a camera, day dive vs. night dive). Each of these will be discussed in more detail on the following sections.

Personal Factors

Personal factors are defined as those factors that the user has brought with him/her to the scuba diving or snorkeling activity he/she is involved in. Studies by Luna et al. (2009) and Harriot et al. (1997) have investigated the factor of the experience level of scuba divers (number of scuba dives the user has made). These studies reported that scuba divers with increased experience created fewer contacts. Another measure of experience that could be investigated is the number of years a user has been scuba diving or snorkeling. Furthermore, examining certification level could also provide insight into impact frequency as increasing certification levels may provide resource users with additional skills necessary to minimize impacts. Personal factors also include the motivations a resource user might have for participating in a particular activity (such as scuba diving or snorkeling), or the beliefs a resource user might have about a range of things related to the activity or experience (such as what is good/bad about the experience, what the resource user believes others will think of him/her, what the resource user believes he/she is capable/incapable of doing).

Environmental Factors

Environmental factors are defined as those factors imposed onto scuba divers/snorkelers by the surrounding environmental and/or water conditions. These factors include current, tidal height (for snorkelers), surge, underwater visibility, surface conditions and weather conditions. Some authors have reported that in the presence of a strong current divers tend to make more contacts with the substrate to steady themselves, especially if diving with a camera (Harriott et al., 1997, Rouphael and Inglis, 1997). A more recent study by Barker and Roberts (2004) suggested that current has no significant effect on contact rates. Barker and Roberts (2004) also examined visibility (night-time dive versus daytime dive) and found that with reduced visibility divers were more than twice as likely to make contacts with the substrate. However, no studies examined different levels of daytime visibility in relation to resource user impacts, nor have any studies examined tidal height or surge as environmental factors that could influence scuba diver/snorkeler behavior.

Situational Factors

Situational factors are defined as those factors that differ from one scuba dive/snorkel to another scuba dive/snorkel (excluding environmental factors as defined above). These factors can include amongst others: camera use, boat vs. shore dive, daytime vs. night dive, reef topography, group size and marine life assemblages. Different types of dives/snorkels could influence the number of contacts a diver/snorkeler has with the reef substrate. A study in St

Lucia (Barker and Roberts, 2004) found that scuba divers with cameras resulted in more contacts than without cameras, dives from the shore resulted in more contacts than dives from a boat, and dives conducted at night resulted in more contacts with the reef than dives conducted during daylight hours. Studies have shown that the topography of the dive site does not have an influence on the number of contacts a scuba diver has with the reef (Barker and Roberts, 2004, Rouphael and Inglis, 1997, Luna et al., 2009). Fish assemblages were similar for dived areas and non-dived areas (Hawkins et al., 1999).

Figure 1.1 depicts how the above-mentioned factors can influence a specific behavior. The behavior is said to be volitional if it is under the complete control of the individual. For example, if strong current, or a poor visibility results in the a person making frequent contacts with the reef despite repetitive efforts to avoid these contacts, the behavior is said to be non-volitional as the person cannot control the current or the underwater visibility.

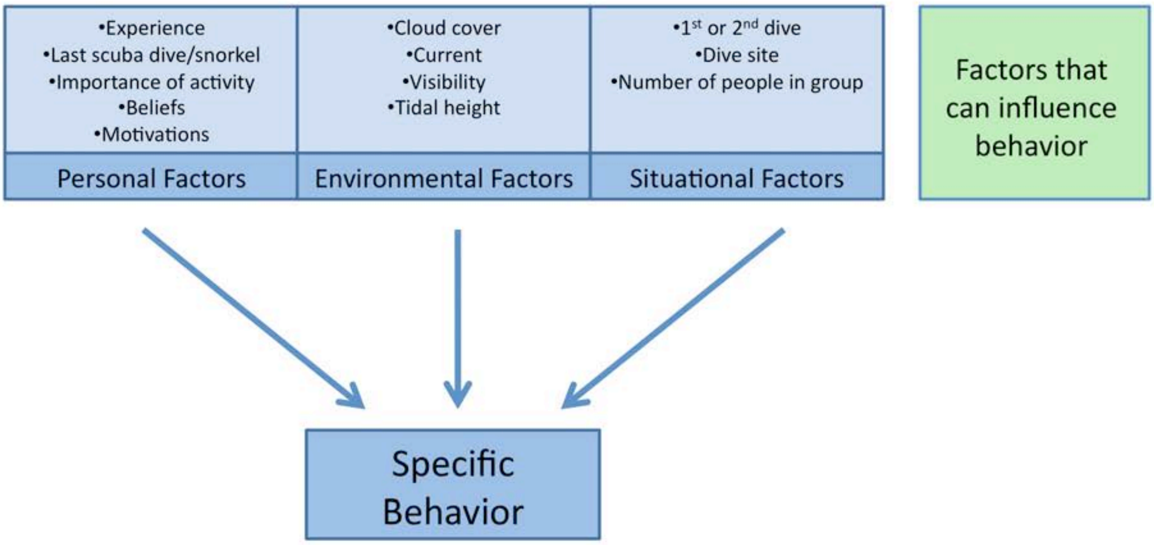


Figure 1.1. The factors that can influence a specific behavior.

Studies examining the behavior of marine recreational resource users (scuba divers and snorkelers) have mostly examined the types of impacts created by the resource users (Barker and Roberts, 2004, Rouphael and Inglis, 1997, Hawkins et al., 1999). Some studies have also examined how attitudes and awareness can link to different types of impact (Leujak and Ormond, 2007, Dearden et al., 2007, Dearden et al., 2006, Kler and Tribe, 2012, Moskwa, 2012, Ong and Musa, 2012, Thapa et al., 2005) or how experience can determine impacts (Luna et al., 2009, Harriott et al., 1997, Coghlan, 2012, Dearden et al., 2007). Research into factors that drive behavior have also been conducted such as personal factors (e.g. experience as described above), environmental factors (Harriott et al., 1997, Rouphael and Inglis, 1997, Barker and Roberts, 2004) and situational factors (Barker and Roberts, 2004, Rouphael and Inglis, 1997, Luna et al., 2009). However, factors that can be influenced by interpretive efforts (to bring about behavior change) are some of the personal factors such as norms, attitudes and motivations. An understanding of behavior theory is necessary to determine the importance of these factors as drivers of behavior, and how these drivers can be influenced to change behavior into more pro-environmental behavior.

Behavior and Behavior Change

Behavior, as conceptualized in this thesis, is a function of attitudes, norms, control and intentions. Therefore, to gain an insight into behavior, and behavior change, these terms must first be clarified. Attitude is defined as an evaluation, whether positive or negative, about someone, something or some issue (Newhouse, 1990, Ajzen, 1992, Breckler et al., 2006). Petty et al. (1992) define attitude as: "an important mediating variable between the acquisition of new knowledge, on the one hand, and behavioral change, on the other" (p. 78). Attitudes are generally comprised of three elements: affective domain (feelings); cognitive domain (beliefs) and past behavior (Breckler et al., 2006). The cognitive domain is based largely on beliefs, which in turn are created by (among other things) values, (other) attitudes and information. Information can shape beliefs about a person, object or issue, and can be based on fact or personal opinion (Newhouse, 1990). An attitude toward any behavior is formed not by one single belief but rather by numerous beliefs, each carrying its own evaluative strength (Manfredo and Fishbein, 1992). Vincent and Fazio (1992) simplify the definition of attitude as: "the association in memory between an object and an evaluation" (p. 59), or Petty and Cacioppo (1986) state: "a general evaluation held toward objects" (quoted in Hendricks 2004), p. 203. It is generally accepted that attitude is very influential on behavior (e.g., Newhouse 1990, Beaumont 1998, Hendricks 2000) as it determines what we observe, how these observations are interpreted and which of these observations are retained (Breckler et al., 2006). However, the attitude-behavior relationship is a complex relationship as the exact relationship is not always clear, nor strong. Finally, attitudes can contain both positive and negative evaluations towards a specific object and these are termed ambivalent attitudes (Breckler et al., 2006). The resultant behavior will depend on the balance of positive versus negative evaluations.

Norms are also important when understanding behavior as they can also influence what drivers influence behavior. Norms are shared beliefs that dictate whether or not to perform a certain behavior. They can be classed as subjective norms or personal norms. Societal pressures influence subjective norms: 'what will society (or relevant others) think of me if I perform this behavior' (Ajzen, 1992, Thogersen and Aarhus, 2007). Subjective norms could prevent people from exhibiting certain behavior despite their attitude (Newhouse, 1990). Personal norms are influenced by moral obligation: 'this is the morally correct behavior for me' (Thogersen and Aarhus, 2007). When comparing the influence of the personal norm to that of the subjective norm in the creation of environmentally responsible behavior, the former has been found to be more influential (Baldassare and Katz, 1992, Bratt, 1999, Harland et al., 1999, Thogersen, 1999, Thogersen and Aarhus, 2007). This statement does not indicate that subjective norms are meaningless; rather, they are just less influential when it comes to environmentally responsible behavior (such as not contacting the reef substrate).

Behavior is linked to attitudes and norms through intentions. Intentions state a person's plan to perform or not perform a certain behavior (Breckler et al., 2006). To influence intentions, the norms, or attitudes toward the behavior must be changed (Manfredo and Fishbein, 1992). Attitudes tend to influence intentions more when they are strong and norms are weak, and the opposite holds true for normative considerations. Ajzen (1985) states that intentions can predict behavior if two conditions are met: (1) the intention is measured right before the behavior occurs; and (2) the behavior must be volitional. Ajzen continues to clarify that intentions change as a result of time and the acquisition of new information.

Attitudes, norms and intentions are some of the factors that determine behavior. One must also consider the ability a person has in being able to perform, or not perform, a specific behavior (termed 'control'-this concept is explained below). These factors taken together constitute part of a behavior model (such as TPB outlined below) and fall into the category of personal factors or drivers that can influence behavior (as described previously).

Behavior and Behavior Change Models

Numerous models exist to explain behavior, each with its own strengths and weaknesses, and each with their specific area of application (Table 1.2). The route to changing behavior is also described by a variety of models, each again with its respective strengths and weaknesses, and each with its specific area of application (Table 1.3). An understanding of behavior theory will assist in choosing the best models for the desired outcome in a particular application. The Theory of Planned Behavior (TPB) is a model used to explain behavior. TPB was chosen for this study to understand how to best influence the behavior of contacting the reef substrate by resource users in a marine environment. Applications of TPB in resource use, and especially marine resource use, are limited (Bamberg and Schmidt, 2003), yet TPB has been validated in hundreds of studies and has a varied field of application (Bamberg and Schmidt, 2003, Ham et al., 2009, Hrubes et al., 2001), thereby making it the preferred model for this study. TPB will be used to identify how to best target the personal variables that determine behavior. These personal variables are important, as these are the variables that can be targeted by interpretive efforts and/or behavior change theory. The behavior change model that was chosen for this study was the Elaboration Likelihood Model (ELM) as it is a persuasion model that works well in conjunction with TPB.

Table 1.2. Some of the different models that explain behavior.

Behavior Model	Reference
Theory of Reasoned Action	Ajzen and Fishbein, 1980
Theory of Planned Behavior	Ajzen, 1985
Theory of Interpersonal Behavior	Triandis, 1977
The Norm Activation Model	Scwartz, 1977
Value Belief Norm Theory	Stern et al., 1999

Table 1.3. Some of the different models that describe behavior change.

Behavior Change Model	Reference
Cognitive Response Theory	Breckler et al., 2006
Heuristic Persuasion Theory	Chaiken, 1980
Systematic Heuristic Model	Breckler et al., 2006
Elaboration Likelihood Model	Petty et al., 1992
Cognitive Dissonance Theory	Breckler et al., 2006
The Affective Domain	Orams 1994
Community Based Social Marketing	McKenzie-Mohr 2000
Breaking Habits	Dahlstrand and Biel, 1997

Theory of Planned Behavior

There are numerous different behavior models that exist to explain behavior. These behavior models represent a theoretical framework that can be used to assist the researcher when researching behavior in a specific research domain. Certain models are preferred for specific domains of research. This preference is because some models work better in certain fields than others. One therefore chooses a behavior model based on the field of research he/she is researching. Complications arise when one is researching a field that has had very little or no applications of a behavior model. Applications of a behavior model in the field of resource use are limited, and even more so when further defined to the field of marine recreational resource use. TPB has been validated in numerous studies to predict human behavior and the range of its applications include health, medicine, occupational safety, energy use, personal mode of transportation, voting, purchasing, and protected area behaviors aimed at being environmentally-friendly (Ham et al., 2009). Behavior pertinent to protected areas includes those associated with camping, staying on tracks, visitor safety, and philanthropy. In outdoor recreation activities it has been used to predict behavior related to mountain climbing, boating, biking and hunting (Hrubes et al., 2001). For this reason, it was decided to use TPB as the guiding framework to help understand behavior of marine resource users, specifically the contacting of reef substrates.

TPB is a refinement of The Theory of Reasoned Action (TRA), first proposed by Ajzen and Fishbein in 1975 to explain human behavior in terms of its underlying cognitions (Ajzen and Fishbein, 1980). TRA is a human behavior theory that has three main components: attitudes, subjective norm and behavioral intentions (these are all personal factors that can be targeted by interpretive efforts). This model states that behavior is dictated by behavioral intention (Figure 1.2), which in turn is a product of the attitudes and subjective norms regarding a particular behavior. Attitudes and subjective norms are in turn created by the underlying behavioral beliefs and normative beliefs respectively. There are numerous beliefs about any particular behavior but only a few dominant beliefs become important when the opportunity presents itself in performing the behavior. These important beliefs are referred to as the salient beliefs towards that behavior. Salient beliefs could be behavioral or normative beliefs and to influence behavior successfully, these salient beliefs must be identified and targeted by communication efforts (Ham et al., 2009).

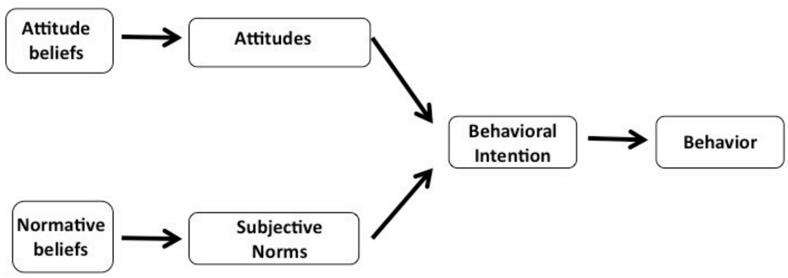


Figure 1.2. Theory of Reasoned Action (adapted from Munro et al., 2007).

The attitude a person might have toward a specific behavior will be a good/bad evaluation towards that particular behavior which stems from that person's underlying beliefs about the consequences of the behavior (Breckler et al., 2006). The other half of the influence on behavioral intentions is the subjective norm. Subjective norms are people's feelings that their behavior, or lack of behavior, will meet with approval or disapproval from other people (Breckler et al., 2006). According to the TRA when both the attitudes and subjective norms are in agreement then behavior is fairly predictable (either perform the behavior or not perform the behavior), as behavioral intentions are strong. When attitudes and subjective norms are inconsistent with each other, behavioral intention is weak, and behavior is not as easy to predict.

TRA has been widely used in a variety of domains to predict and explain why people do, or do not, act in certain ways. Diverse examples include: voting behavior, donating blood, consumer purchases, eating out, flossing one's teeth every day, and participating in political protest marches (Breckler et al., 2006). Attitudes are good predictors of behavior when the person performing the behavior has direct experience with the issue or has discussed the issue beforehand (Manfredo et al., 1992). When a person has no prior experience regarding an issue and therefore has no predispositions regarding the issue, other factors will tend to be more important in creating behavioral intentions, for example, they might be influenced by what other people around them are doing (explained by the subjective norm; (Manfredo et al., 1992)).

Ajzen (1985) modified TRA and developed the Theory of Planned Behavior (TPB) to account for perceived and actual behavioral control. TRA shows that behavioral intentions lead to behavior. However, an individual does not always have control in going through with the behavioral intentions to perform the behavior. To account for this factor of control, Ajzen, expanded TRA into TPB and included the control component (Figure 1.3). This control component is referred to as perceived behavioral control, which in turn is based on underlying control beliefs (similar to the attitudes and subjective norms described in TRA). TPB states that an individual is likely to perform a behavior when the attitude toward that behavior is favorable; the subjective norm dictates they perform the action, and, they perceive to have control over performing the behavior. If perceived behavioral control is low then attitudes and subjective norm might not be strong enough to create the intended behavior. According to TPB salient beliefs can be behavioral, normative or control beliefs.

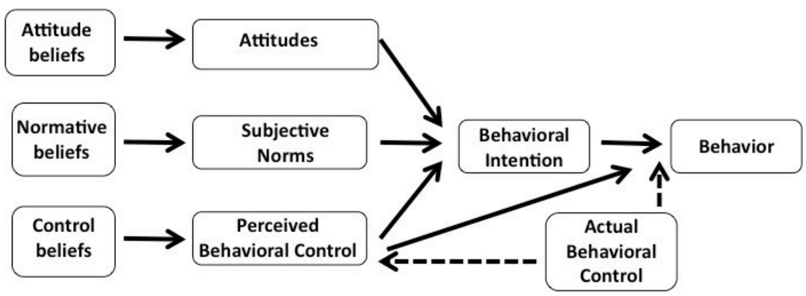


Figure 1.3. Theory of Planned Behavior (adapted from Ajzen 2005).

The behavioral beliefs are what a person believes the positive or negative outcome would be if he/she performed a particular behavior. These behavioral beliefs will then result in either a positive or negative attitude toward that behavior. To measure the most important behavioral beliefs towards a particular behavior one must know the strength of that belief (how much a person believes it to be true) and the evaluation of that belief (how good/bad a person believes it to be).

Norms are shared beliefs that dictate whether or not to perform a certain behavior. The normative beliefs describe how a person thinks someone they consider important believes he/she should, or should not perform a behavior. These normative beliefs create a subjective norm, or social pressure, that influence the performance of the behavior. To measure the most important normative beliefs towards a particular behavior one must measure two parts of the beliefs. The first is to determine the social referents (Ham et al., 2009), or those important others the person would believe would approve/disapprove to performing the behavior, and how strongly the person believes they would approve/disapprove. The second part that will need to be measured is the motivation to comply, or how much a person wishes to adhere to the wishes of the social referent (Ham et al., 2009).

A person's control beliefs relate to the ease with which a person feels he/she can perform a specific behavior (is he/she able to perform the behavior), and these in turn will create the perceived behavioral control. When a domain of behavior is not controllable, either because the individual believes it is not controllable or it actually is not controllable, the behavioral intentions will not be predicted by attitudes, and the attitude-behavior relationship becomes attenuated (Breckler et al., 2006). Perceived and actual behavioral control can include factors such as: external threat (e.g., snorkelers do not contact the reef for fear of being fined financially), lack of alternatives (e.g., someone dislikes the local paper but reads it anyway for lack of alternatives), biological needs or addictions (e.g., parents telling their children to eat healthy foods they do not like, or a smoker who does not try to give up smoking as he believes he is too addicted) and/or lack of time (e.g., someone may want to do something but not have the time to do it: the intention is there but behavioral control prevents the behavior from occurring). The greater the volitional control an individual has over a behavior, the less important the perceived control component becomes (Hrubes et al., 2001). To measure the most important control beliefs, one must measure the strength of what the person perceives to facilitate (facilitator) or hinder (inhibitor) the behavior, and the ease or difficulty with which the behavior can be performed.

In summary, TPB is a behavior theory that can be used to explain intentional behavior (Ajzen, 1991). In outdoor recreation activities it has been used to predict behavior related to mountain climbing, boating, biking and hunting (Hrubes et al., 2001). TPB is well suited to predict behavior and the model can show that intentions are strongly influenced by all three components of TPB: attitudes, subjective norms and perceived behavioral control. TPB has also been used in health related studies as it better predicts behavior compared to TRA (Ajzen, 1988). Examples include: condom use, leisure, exercise, diet and obesity factors. TPB helps explain what must be targeted when behavior needs to be influenced.

Elaboration Likelihood Model

Changing behavior of recreational resource users from inappropriate to environmentally responsible behavior is a challenge faced by many resource management bodies. Often the failure to create behavior change is due to an underestimation of the processes involved in changing behavior (Newhouse, 1990, Manfredo and Fishbein, 1992, Orams, 1994, Grob, 1995, Cole et al., 1997, McKenzie-Mohr, 2000). The term ‘influencing behavior’ is often used, as it is more accurate than ‘changing behavior’. At times behavior may not need to be changed, just reinforced so that it becomes stronger. ‘Influencing behavior’ thus covers all possible scenarios for behavior change and/or behavior reinforcement. Like behavior models, there are numerous theories to explain behavior change, each with its own area of validated use. The researcher chose to use the Elaboration Likelihood Model (ELM) as a framework to promote more pro-environmental behavior among snorkelers and scuba divers as it has been used in the field of resource management and also with interpretation research (Ham et al., 2009).

ELM is a persuasion model, meaning that the end-result is to exert some form of influence over behavior. Persuasion occurs when someone, something or some issue, convinces somebody to do something. Persuasive communications (messages that are often spoken, visual or media-based) are aimed at attitudes (through behavioral beliefs) to evoke a person to adopt a specific viewpoint (Breckler et al., 2006), in the case of recreational resource use they are most often used to bring about pro-environmental behavior. Persuasive communications have a wide target audience and can be used to change attitudes in a variety of domains: environmental behavior; food preferences; evaluation of people; and political views (for a complete list see Breckler, Olson et al. 2006). Persuasion models are based on persuasive communications and appeal to reason and argue the validity of position to the recipient in an effort to bring about behavior change (Ajzen, 1992). Persuasion models can target behavioral beliefs, thereby influencing the attitudes, intentions and behaviors (Ajzen, 1992, Fishbein and Ajzen, 1975).

The Elaboration Likelihood Model (ELM) has two possible routes to message processing: the peripheral route and the central route to persuasion (Figure 1.4: Manfredo and Bright 1991, Breckler, Olson et al. 2006). The peripheral route is activated when attitude change occurs as a result of non-cognitive factors, for example evaluative conditioning and mere exposure. The peripheral route depends on superficial cues. The central route relies on message content that is carefully analyzed while argument strength determines the resultant behavior. “The result of this processing is that attitude becomes well articulated and integrated into a person’s belief structure” (Petty, McMichael et al. 1992, p. 79).

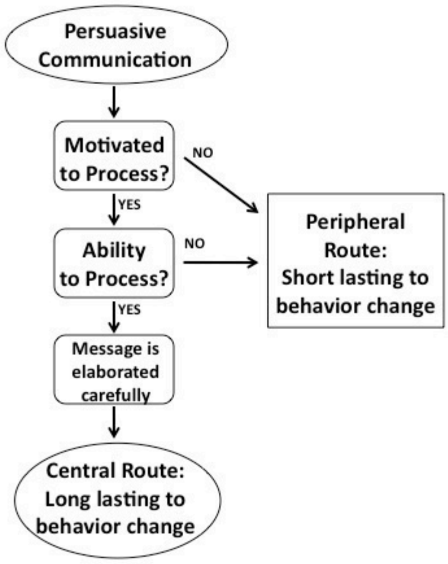


Figure 1.4. Elaboration Likelihood Model showing the peripheral route to persuasion (right) and the central route to persuasion (left; adapted from Petty et al., 1992).

In the Elaboration Likelihood Model individuals use one of the two routes towards behavior change based on their motivation and ability to process a message. Depending on which route is activated, the altered behavior will be either of long-term or short-term duration. The central route to persuasion is activated when an individual is motivated to change behavior and has the ability to analyze the message. When either of these two factors is absent the peripheral route is activated. The central route to persuasion has longer lasting effects than the peripheral route and occurs after high elaboration (Petty et al., 1992, Ajzen, 1992, Manfredo and Bright, 1991, Breckler et al., 2006).

Elaboration is referred to as the critical thinking a person has as a result of a message or communication. When a message is carefully considered (high elaboration) and accepted it creates an attitude in a similar manner causing it to become an argument for future messages that attempt to change attitudes. Peripheral cues have short-term effects as they do not create new arguments (are not based on issue-relevant reasons to change behavior) to be used against future attacks and therefore the changed attitude is short-lived (Manfredo and Bright, 1991, Ajzen, 1992, Breckler et al., 2006, Marion and Reid, 2007). The peripheral route is often activated when elaboration is low or the recipient is unable to process the message (Manfredo and Bright, 1991, Ajzen, 1992). An example is when a famous person advocates for a particular course of action and an individual accepts the course of action based on the recommendation of the famous person (peripheral route to persuasion). However, when the individual no longer has high esteem for this famous person (either through the actions of the famous person, or through the individual's personal feelings), the motivation to perform the advocated behavior is no longer present and the individual will resume the original behavior (Petty et al., 1992).

The careful consideration (elaboration) of a message can be affected by: prior knowledge; direct experience; topic involvement; need for cognition; status in social group; and source credibility (Manfredo and Bright, 1991). The amount of knowledge a recipient has can influence how that recipient argues the persuasive communication. When a recipient has an increased knowledge level that recipient will be able to argue more effectively against a new message, therefore making it easier to support arguments with their current attitude. Furthermore, recipients with a lot of prior knowledge are less likely to encounter messages that offer new information that could influence their current attitude (Manfredo and Bright, 1991, Reilly and Conover, 1983). Direct experience has a positive effect on messages favored by current attitudes and has high resistance to counter attitudinal appeals (Wu and Shaffer, 1987). High topic involvement can create increased elaboration, resulting in the activation of central route to persuasion. Low topic involvement results in less elaboration, activating the peripheral route to persuasion (Chaiken, 1980). The involvement factor is most likely a result of personal relevance to the issue (Manfredo and Bright, 1991). Cacioppo et al. (1983) discovered that when the topic involvement of different recipients is equal, those with a greater need of cognition will be more active in message elaboration, as they will be forced to think more about the message(s) presented to them. Research has found that high social status recipients were less likely to change behavior when confronted by a message as compared to low social status (more subordinate) recipients (Kirchler and Davis, 1986). As mentioned previously, the credibility of the source can be very influential in persuasive communication and this often leads to the peripheral route of persuasion (low elaboration)(Manfredo and Bright, 1991, Ajzen, 1992). Figure 1.5 summarizes the effect of elaboration on behavior change.

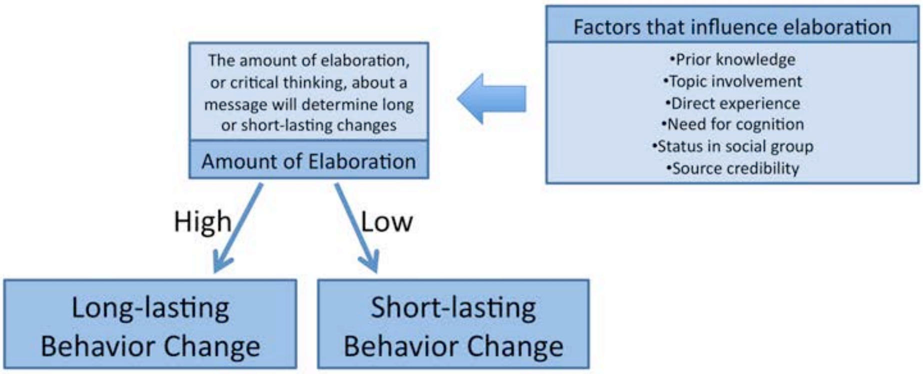


Figure 1.5. The amount of elaboration will determine if the behavior change is long-lasting or short-lasting.

A review of the existing literature has revealed that most studies to date have determined long-term behavior change by measuring the intent to act through questionnaires at the time of data collection (Zeppel and Muloin, 2008, Mayes and Richins, 2008, Armstrong and Weiler, 2002), or through self-report measures on behavior from questionnaires several months later (Orams and Hill, 1998, Marion and Reid, 2007, Howard, 1999). Zeppel (2008) recommends that a need exists for more research on future behavior or long-term behavior changes. The logistics involved in monitoring a person's behavior several months, or years, after initial data has been collected can be difficult, especially if the person in question is a transient resource user (i.e. a tourist). One method that could contribute to predicting future behavior, thus establishing long- or short-term behavior change, is by measuring the behavioral beliefs of a person several months after the initial data collection. These beliefs could then indicate what the resultant behavior could be.

The TORE™ Model of Persuasive Communication

ELM is a theoretical model of how communication can work to persuade somebody of something. The model aims to explain how persuasion works and the different pathways to behavior change. ELM thus provides an understanding of how behavior change occurs. Persuasive communications can target beliefs, attitudes, intentions and behaviors (Fishbein and Ajzen, 1975, Ajzen, 1992, Ballantyne and Packer, 2005). One example of a persuasion method is the TORE™ (Thematic, Organized, Relevant and Enjoyable) model. This model combines TPB and ELM to bring about behavior change. The TORE™ model can be used to increase the likelihood of the central route to persuasion being used, resulting in long-term behavior change. The TORE™ model of communication (Ham, 2007) works on the following four principles: the message must consist of a theme (T) that allows the audience to establish a connection with the message(s), it must be organized (O) in such a manner that the audience can comprehend the message, it must be relevant (R) so that it bonds with the audience (and the audience can relate to the message; (Pastorelli, 1998)), and the message must be enjoyable (E) so that non-captive audiences are entertained (Powell and Ham, 2008, Ham, 1992). Past research on managing scuba diver impacts has suggested a similar manner of presenting informative messages (Townsend, 2008, Lucrezi et al., 2013b). Figure 1.6 shows the process of the TORE^{TM} model.

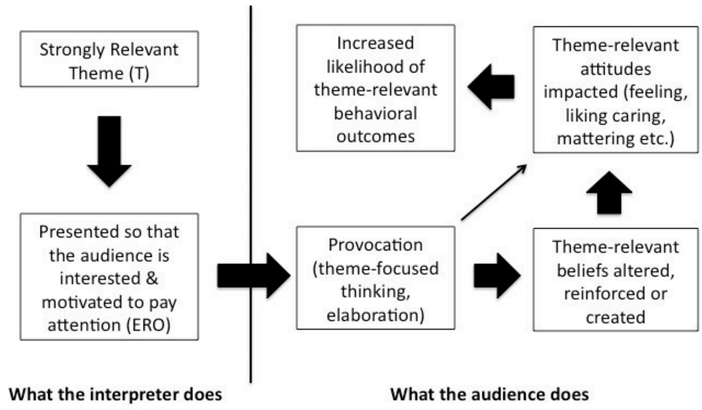


Figure 1.6. The TORE^{TM} model (adapted from Ham 2007).

Themes chosen to underlie the messages of the TORE^{TM} Model are referred to as the salient beliefs regarding a specific behavior (Ham, 2007, Ballantyne and Packer, 2005, Pastorelli, 1998, Ham and Krumpe, 1996, Ballantyne et al., 1998). A salient belief is one of the few important and dominating beliefs that dictate that particular behavior. These salient beliefs would be those underlying beliefs of the personal factors that were identified previously as being of importance in driving behavior. A theme-relevant (derived from the salient beliefs) message is delivered that provokes the audience to elaborate, or critically think about the message. If sufficient elaboration occurs then the underlying beliefs are altered, leading to a change in attitudes that will then most likely result in behavior change (central route to persuasion, the thick arrows in Figure 1.6). If the elaboration is not strong enough, the attitudes and resultant behavior may change, but the underlying beliefs remain unaltered (Figure 1.6: from ‘provocation’ straight to ‘attitudes impacted’, thin arrow). This latter route will therefore also lead to behavior change but it will be of short-lasting effect (peripheral route to persuasion). The TORE^{TM} model thus states that the themes, or salient beliefs, should be targeted in any persuasive communications.

Applications of the TORE^{TM} model have been shown to be effective in numerous studies (Anonymous, 2012, Ham et al., 2009, Powell and Ham, 2008, Wearing et al., 2008, Ham, 2003, O'Brien, 2000, Ham, 1992), yet the framework has not been applied in a recreational marine resource use setting. Applying the TORE™ framework will also ensure that the audience gains a sense of enjoyment (Weiler and Davis, 1993, Luck, 2003, Orams, 1996a). Enjoyment is important as: "people who enjoy an interpretive program are usually more likely to learn from it and to change their attitudes and behaviors" (Moscardo et al. 2004, p. 234).

The Process of Changing Behavior

The TPB framework indicates which components (i.e. salient beliefs) of behavior need to be targeted, while ELM will guide how these components are best targeted. A model that can be used to enhance the efficacy of the interpretation was developed by Ham (1992) and is termed the EROT model (later redefined to the TORE™ model (Ham, 2007)). The TORE™ framework is based on TPB and ELM by targeting the salient beliefs (those important beliefs most responsible for dictating behavior) of the desired behavior in such a manner that behavior change becomes a reality. The TORE™ model combines TPB, ELM and interpretive efforts to create behavior change (Figure 1.7).

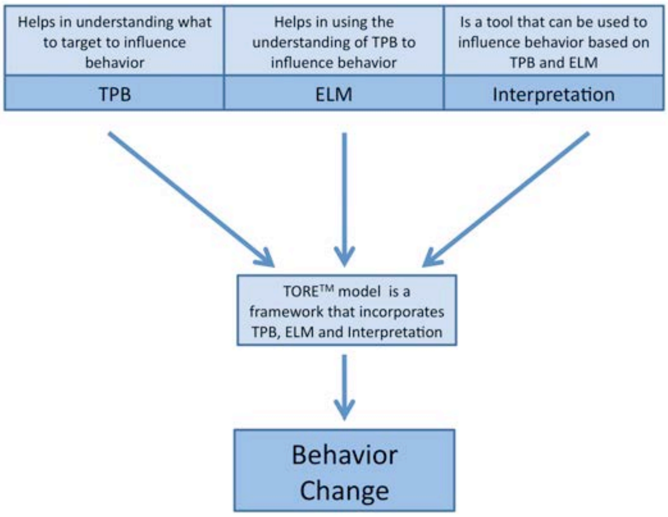


Figure 1.7. The process of changing behavior.

1.2.4. The Theoretical Framework of the Research Project

Figure 1.8 depicts the complete theoretical framework of this research project. The first step consists of identifying the specific behavior that needs to be changed. This research project examines the behavior of not contacting the reef substrate. The second step in the diagram identifies factors that can influence behavior and determines if behavior is under the complete control of the individual (volitional). This step is shown in detail in Figure 1.1. If the behavior is not volitional and behavior change is still desired, some aspects of the activity must be changed to realize behavior change. One example could be the presence of a strong current resulting in repetitive contacts of the reef substrate despite the intentions of the resource user not to contact the reef substrate. Changing the environmental factor (current) may result in behavior change (pro-environmental behavior of not contacting the reef substrate) and this environmental factor can be changed by snorkeling at a different time (slack tide). If it is not possible to change any of the factors (personal, environmental or situational) then behavior change may not be possible and other forms of management may be necessary to afford the resources protection.

If the behavior is volitional it indicates that some of the personal factors can be influenced. These factors include the motivations or beliefs of a person (refer to the Theory of Planned Behavior for a more detailed explanation of these factors). The application of the TORE^{TM} model (based on TPB, ELM and interpretation, Figure 1.7) can then be applied to realize behavior change. In this study the pro-environmental behavior sought was not contacting the reef substrate whilst scuba diving or snorkeling. The duration (long-lasting or short-lasting) of the behavior change is depicted in detail in Figure 1.5 and depends on the amount of elaboration, or critical thinking, as a result of the interpretive efforts delivered by the TORE^{TM} model.

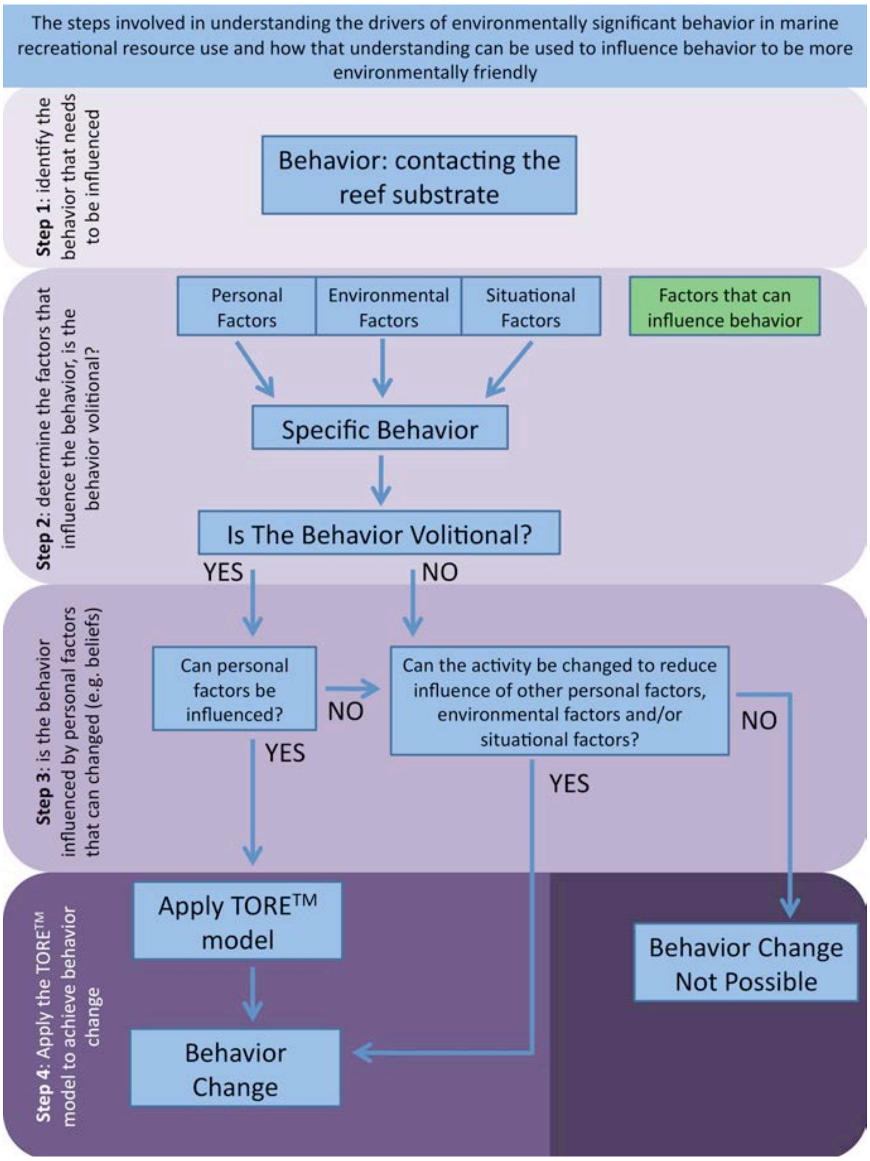


Figure 1.8. The theoretical framework used throughout this research project.

1.3. Research Questions of the Project

The ultimate goal of natural resource management is to ensure resource sustainability. Recreational use of the resources can threaten the sustainability of the resources if the recreational resource users (referred to as scuba divers and snorkelers throughout this thesis) do not engage with the resources in an environmentally responsible manner. Interpretation is one tool that can be used to influence the actions or inactions of recreational resource users, yet more research is needed on this topic (Beaumont, 1998). Research (Aiello, 1998, Luck, 2003) has shown that resource visitors: "are an audience ripe for education programs" (Jacobson and Marynowski 1997, p. 779). However, for interpretation programs to be effective and successful they must be properly designed, implemented, and delivered, making use of underlying behavior theory. Current interpretation programs used in natural resource management are not abundant; suffer from limitations; and are often poorly designed (Tanner, 1999, Stern, 2005, Marion and Reid, 2007, Orams, 1996b). Manning (2003) also lists some case studies of interpretation programs needing substantial improvements.

Interpretation as a management tool has not been used as much as other forms of management mechanisms such as regulatory and/or physical options (Orams, 1996a). Various authors (Orams, 1996a, Cole et al., 1997, Beaumont, 1998, Tanner, 1999) state that there is a gap between environmental awareness and behavior as demonstrated by various other studies, and often interpretation programs fail to use the educational and/or environmental psychology research that exists in interpretation programs and management plans (Orams, 1994), despite its obvious importance (McKenzie-Mohr, 2000). Using the existing literature, and realizing past limitations of this literature, the research questions of this research project are as follows:

(1) What type of behavior do scuba divers and snorkelers exercise while engaged in their recreational activity?
    a. What are the drivers that influence these behaviors of scuba divers and snorkelers?
(2) What are the important salient beliefs of scuba divers and snorkelers, and how can these be targeted to influence behavior?
(3) How can salient beliefs be incorporated into an interpretation program to influence the behavior of snorkelers?
(4) What variables influence the effectiveness of guide interpretation?
(5) How can an interpretation program enhance the experience of snorkelers?
(6) If targeting salient beliefs in interpretive efforts results in behavior change, are these long-term or short-term behavior changes?

Table 1.4 illustrates where these research questions will be answered throughout the thesis.

Table 1.4. The overall research design indicating where the research questions are answered throughout the thesis.

Research Questions	Chapter Number	Chapter Title
What type of behavior do scuba divers and snorkelers exercise while engaged in their recreational activity?	2	Exploring Scuba Diver and Snorkeler Behavior
What are the driving salient beliefs of scuba divers and snorkelers and how can these be targeted to influence behavior?	3	Setting the Scene for Interpretation: the Salient Beliefs of Scuba Divers and Snorkelers
How can salient beliefs be incorporated into an interpretation program to influence the behavior of the snorkelers?	4, and Appendix 1	Testing Interpretation, An Interpretive Workshop
What variables influence the effectiveness of guide interpretation?	4, and Appendix 1	Testing Interpretation, An Interpretive Workshop
How can an interpretation program enhance the experience of snorkelers?	4	Testing Interpretation
If targeting salient beliefs in interpretive efforts results in behavior change, are these long-term or short-term behavior changes?	5	Long term Belief Changes

1.4. Research and Thesis Layout

This research project consists of four different components. The first study (*Chapter 2*) consists of exploring the recreational resource use behavior of scuba divers and snorkelers to determine the extent of their impacts on the marine environment. This chapter examines the influence of personal, situational, and environmental factors and determines if the behavior of contacting the reef substrate is volitional. This chapter further determines if behavior change is appropriate and provides an indication of where interpretive efforts would be most effective. The next study (*Chapter 3*) discovers the salient beliefs of scuba divers and snorkelers in a recreational marine resource use setting. The third study (*Chapter 4*) and subsequent parts of the thesis focus only on snorkelers due to constraints of fieldwork. The salient beliefs of the snorkelers were incorporated into an interpretation program aimed at influencing recreational resource user behavior (*Appendix 1*). The third study assesses the application of the TORE^{TM} model to investigate the potential for behavior change in snorkelers contacting the reef substrate. The final study (*Chapter 5*) then investigates if behavior beliefs are changed for a long-term duration. Each chapter is a stand-alone manuscript to be submitted for publication in a peer-reviewed journal. Figure 1.9 depicts the research design illustrating how the different chapters are linked.

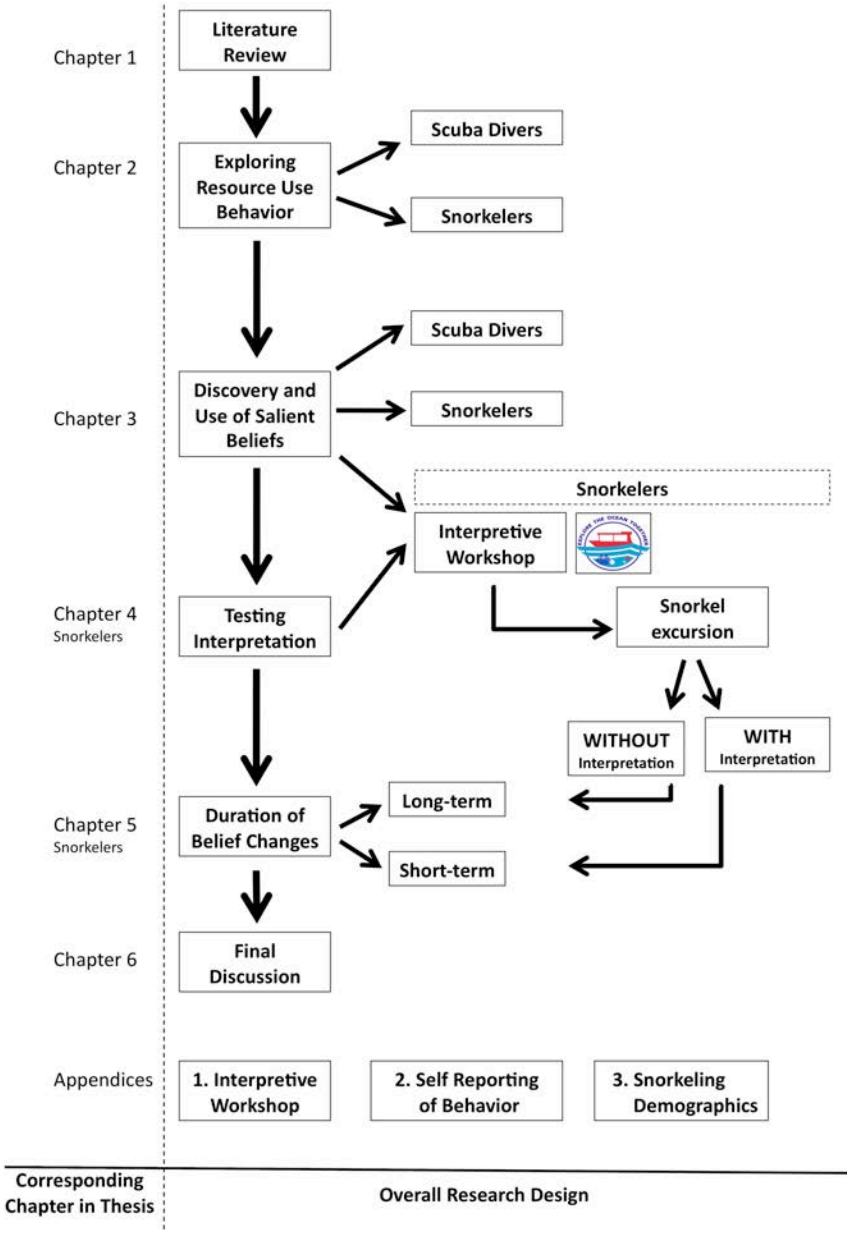


Figure 1.9. The overall research design indicating how the different chapters link to each other.

1.5. Study Site

This study was conducted in the Mombasa Marine Park and Reserve, Kenya (Figure 1.10). The Mombasa Marine Park and Reserve is located north of Mombasa island and spans nearly 15 kilometers of coastline. The park was legally gazetted in 1986, however legal protection was not enforced until the mid-1990’s (McClanahan, 1994). The park and reserve are currently managed by the Kenya Wildlife Service, under authority of the Ministry of Environment and Natural Resources (McClanahan et al., 2005). The park covers a total of 210 km^2 (200 km^2 for the Reserve and 10 km^2 for the Park). Within the park extractive activities are prohibited, while the reserve tolerates artisanal fishing practices (Ransom and Mangi, 2010). Recreational resource use, such as sailing, scuba diving and snorkeling, is permitted in both the park and reserve.

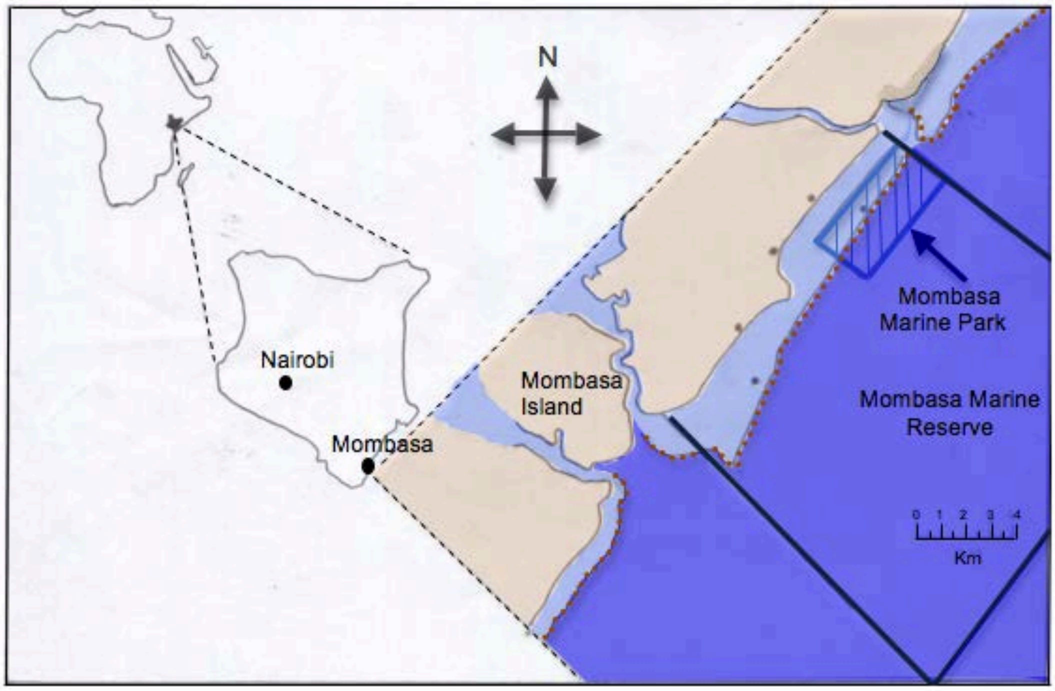


Figure 1.10. Map of the Mombasa Marine Park and Reserve, Kenya, showing the reserve and park boundaries.

1.5.1. Scuba Diving Activity Overview

There are five diving operators that are based within the Mombasa Marine Park and Reserve and each of these operators cater for recreational scuba dives within the Mombasa Marine Park and Reserve, as well as scuba dives outside of the park and reserve boundaries. The data collection was facilitated by one dive operator, represented by dive bases in the southern and northern half of the reserve. This operator conducted daily double-dive excursions to dive sites within and beyond the boundaries of the park and reserve. This research project only included scuba dives on a stretch of fringing reef within the park called Bamburi Reef. Bamburi Reef was further divided into six dive sites (Figure 1.11), each ~200m in length. All scuba dive departures left the base at either 0800 or 0900 (depending on the season: rough season (May-September) and calm season (October-April) respectively), and motored to the first dive site. Scuba divers were led by a dive guide (PADI (Professional Association of Diving Instructors) certified Divemaster or Instructor) at a ratio that did not exceed five scuba divers to one dive guide. All scuba dives were drift dives where the prevailing current would push the divers along the reef for the duration of the scuba dive (usually in a northerly direction). The second scuba dive was completed in similar fashion after a 45-minute surface interval on the boat. The scuba dive sites along Bamburi Reef were all of similar topography and diversity. The top of the reef slope starts at ~7-8m depth and the reef then gently slopes down to ~20m. The average depth of the scuba dives was ~15m. The six individual dive sites were distinguished by a length of the reef and a mooring buoy indicating the start of that dive site. Due to the low frequency of dive operators within the study area, boats generally did not moor together on one mooring.

Figure 1.11. Map of the Mombasa Marine Park showing scuba diving locations (from Google Earth).

The author previously spent five years employed in the recreational scuba diving industry in the Mombasa Marine Park and Reserve and as such has an understanding of the scuba diver demographics within this geographic area. Scuba diving is a popular recreational activity in the Mombasa Marine Park and Reserve, Kenya. Most recreational resource users that engage in this activity are tourists (ie transient resource users) that visit the Mombasa area for a duration of 1-2 weeks. These tourists originate mostly from Western Europe (United Kingdom, Germany and France are the three most popular countries of origin). Scuba diving is not the main reason for their visit to Mombasa, yet once in the Mombasa area, they will engage in diving activities.

1.5.2. Snorkeler Activity Overview

Snorkeling excursions consisted of fee-paying clients who ventured into the marine park on a snorkeling boat. The snorkel boats were all equipped with a glass viewing window in the hull. The snorkel boat was equipped with a captain and a snorkel guide (together referred to as the crew of the boat). The snorkel boat frequented one or more of several locations. Bamburi Coral Garden (Figure 1.12) is a lagoon patch reef visited by snorkel operators as part of their excursion. The site has a maximum depth of 7m within the middle of an ovular area that shallows out to a depth of 1m around the edges. This core area has a length of ~50m and a width of ~30m. This core area, and the surrounding ~40m in all directions (depth range is 0.5-1.5m), is where the snorkeling activities occur. The area labeled as the Reef Walk Area in Figure 1.12 is an area visited by all snorkeling excursions when permitted by the tide. At low tide the reef flat is exposed and the clients of the snorkeling boats venture on a guided walk on this reef flat. Occasionally these snorkeling boats also frequent additional patch reefs for more snorkeling activities (Starfish ~50x40m, 1-1.5m depth range; Severin Bommies ~70x40m, 1.5-2.5m depth range). Within the Mombasa Marine Park and Reserve there are 5 main departure points for the snorkel boats that provide the snorkeling excursions (Figure 1.12). One of these departure points, located in the southern part of the Reserve does not frequent the sites described above but rather frequents only areas in the southern reserve. The boats (only 2) operating from this departure point were not included in this study. There are usually ~25-30 snorkel boats operating within the Mombasa Marine Park and Reserve depending on any ongoing maintenance of the boats. On any given day there were approximately 3-8 boats moored simultaneously at Bamburi Coral Garden. Factors that determined the amount of boats include: state of the tide, weather conditions and tourist high/low season. Not all the boats had snorkeling passengers as numerous visitors only join the excursion to make use of the glass viewing chamber and not enter the water. Personal observations indicated that throughout the excursion the guide was very uncommunicative and would only supply information when asked. Often times this information was incomplete and inaccurate. Most recreational resource users that snorkel are of English, German or French origin and are visiting tourists (transient resource users). *Appendix 3* provides a detailed description of the demographics of the Mombasa marine Park and Reserve visitors.

Figure 1.12. Map of the Mombasa Marine Park showing the snorkeling locations (from Google Earth).

Chapter 2: Exploring the Behavior of Scuba Divers and Snorkelers in the Mombasa Marine Park and Reserve, Kenya

2.1. Introduction

Scuba diving and snorkeling are popular recreational activities on coral reefs throughout the world. As with all resource use, these activities can lead to negative impacts on the resource, regardless of how minimal or careful these visitors are (Leung and Marion, 2000, Madin and Fenton, 2004, Marion and Reid, 2007). If the resources are to be preserved for future generations, or for a sustainable source of income, then management of these resources must include minimizing these negative impacts (Marion and Rogers, 1994, Hammitt and Cole, 1998). To address such management, an understanding of visitor behavior, and the impact that behavior can have on the reef ecosystem, is essential. As discussed in the previous chapter (see *section 1.2.4 of the Literature Review* and Figure 1.8), a range of personal, situational, and environmental variables could have an effect on the behavior of scuba divers and snorkelers. Understanding factors that influence visitor behavior is also crucial to determine the effectiveness of interventions designed to influence visitor behavior and reduce negative impacts on the reef. This study investigates the behavior of scuba divers and snorkelers in the Mombasa Marine Park and Reserve, Kenya, to (a) describe and assess the impacts of their behavior on the reef substrate, and (b) to investigate factors that influence their potentially damaging behaviors. Furthermore, this study also investigates the behavior of the scuba diving and snorkeling guides to determine if their behavior has the potential to create damaging behaviors on the reef, and/or if their behavior is another factor that can positively influence visitor behavior. The following section (*Theoretical Framework*) reviews literature on environmental impacts of scuba divers and snorkelers and the factors that have been found to influence respective behaviors. Specific research questions are derived from this review and presented at the end of the *Introduction*.

2.1.1. Theoretical Framework

Impacts of Scuba Divers and Snorkelers

To date there have been no studies of the negative environmental impacts of scuba diving or snorkeling activities in the Mombasa Marine Park and Reserve. However, research conducted elsewhere suggests that such recreational activities can create significant impacts including: coral breakages, sedimentation of coral reefs, harassment of marine life, and/or trampling of the reef substrate (for example: Rouphael and Inglis 1997, Hawkins, Roberts et al. 1999, Plathong, Inglis et al. 2000, Barker and Roberts 2004, Dearden, Bennett et al. 2007, Luna, Perez et al. 2009). A study on an Australian reef area found that coral cover was reduced from 41% to 8% coral cover after only 18 traverses by visitors (Woodland and Hooper, 1977). The bulk of the degraded corals were branching corals, whereas the robust massive colonies survived.

Most coral damage caused by scuba divers occurs when divers' fins contact the corals and break off outer extremities of the coral (the following studies report the percentage of breakages caused by fins: 97% (Rouphael and Inglis, 1997), 95% (Barker and Roberts, 2004) and 79% (Luna et al., 2009)). Scuba divers were observed to make contacts with their hands on a regular basis: 5.41 contacts per 10-minute period (Rouphael and Inglis, 1997) and three contacts per 10-minute period (Luna et al., 2009). These studies did not indicate the context of the contacts, but options could include: curiosity, regaining one's balance, wildlife interaction or an unknowing contact. Contacts with diver equipment (such as dangling hoses, camera's, underwater torches) also accounted for coral damage, but less than the damage by fins and hands (Luna et al., 2009, Barker and Roberts, 2004). A study in the Great Barrier Reef by Rouphael et al. (1997) revealed that 13% of all observed divers caused damage to the reef in a 10-minute observation period. Luna et al. (2009) showed that observed divers made 41 contacts, mostly by flapping of the arms, in a 10-minute observation period in a study in the Mediterranean. Studies in the Caribbean (Hawkins et al., 1999, Tratalos and Austin, 2001) revealed that dive sites with high diving pressure had greater amounts of loose coral fragments, more dead corals and more rubble compared to dive sites that had little diving pressure, or no diving pressure. A study by Allison (1996) examining snorkel behavior in the Maldives revealed that most breakages occur when snorkelers stand on, or kick the coral colonies with their fins.

When corals suffer damage, algal growth sets in creating a 'less aesthetic' appeal of that reef to future visitors (Allison, 1996). Furthermore, corals that have been damaged tend to grow slower than undamaged corals, thereby slowing down reef repair (Liddle and Kay, 1987). Long-term degradation of a dive site depends on two factors: 1) rate of new damage, and 2) repair rate of the reef through growth and recruitment of coral. The demise of one group of corals can also alter the coral population structure on that reef, as different types of corals may outgrow the damaged coral types (Hawkins et al., 1999). These disturbances can be brought about by the intentional or non-intentional behavior of the scuba divers/snorkelers. Often times visitors may not even be aware of the impacts they have caused (Marion and Reid, 2007, Bradley, 1979). Barker et al. (2004) found that 81% of the observed contacts in their study of scuba divers appeared to be unintentional.

The studies reviewed above indicate that recreational scuba diving has the potential to cause significant damaging impacts to the marine ecosystem. Furthermore, the types of behaviors that are responsible for these impacts are varied. To date there have been few studies examining the behavior of snorkelers but based on the literature regarding the impacts of scuba diving it is reasonable to expect similar impacts from snorkelers. Consequently, determining the types of impacts scuba divers and snorkelers make on the reef substrate in the Mombasa Marine Park and Reserve is an important step in understanding how these negative impacts can be managed or reduced.

Factors Influencing Impacts

To create a management intervention aimed at reducing scuba diving and snorkeling impacts one must first understand key factors that drive damaging visitor behavior. Of particular importance is whether the potentially damaging behavior is volitional (i.e. whether damaging actions are the result of choices individual users make), and if so, what variables influence those choices. Reviewed literature has revealed the following classes of factors that can influence the behavior of scuba divers and snorkelers:

1. personal factors: those factors that the user has brought with him/her to the scuba diving or snorkeling activity he/she is involved in (e.g., experience level, skill level),
2. environmental factors: those factors imposed onto scuba divers/snorkelers by the surrounding environmental and/or water conditions (e.g., visibility, current), and
3. situational factors: those factors that differ from one scuba dive/snorkel to another scuba dive/snorkel (e.g., shore vs. boat dive, carrying a camera, day dive vs. night dive).

These factors are described in the *Chapter 1, section 1.2.3 of the Literature Review* and depicted again in Figure 2.1.

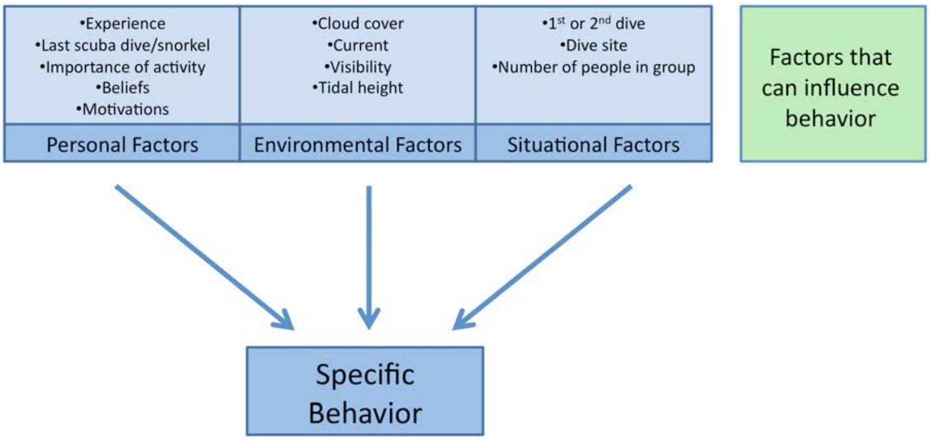


Figure 2.1. The factors that can influence a specific behavior.

Guides and Visitors

Another factor that could influence visitor behavior is that of the scuba diving/snorkeling guides (persons who guide the activity). Guides are often seen as role-models and often sought for guidance about how to behave within natural environments (Skanavis and Giannoulis, 2009, Littlefair, 2003). The guide's behavior may also exert some influence on his/her client. This could influence some of the personal variables (beliefs or motivations of the diver/snorkeler) or situational variables, especially if the presence of a guide is seen as a form of enforcement).

Barker and Roberts (2004) found that dive leader intervention was successful in reducing the number of coral contacts and breakages by scuba divers. Recreational resource users may not realize what is acceptable or permissible and may replicate the guide's behavior while scuba diving or snorkeling, assuming that the guide's behavior is acceptable and permissible. Scuba diving and snorkel excursions in the Mombasa Marine Park and Reserve, on the coast of Kenya, consist of clients paying for a scuba dive/snorkel excursion that is then subsequently led by a guide. Knowledgeable guides enforcing conservation-minded dive/snorkel techniques may influence pro-environmental behavior among visitors. Therefore, determining the relationship between the behavior of the guide and that of the visitor may be important if the aim is to influence scuba diver/snorkeler behavior into more pro-environmental behavior.

Thus, understanding the influence of personal, environmental and situational factors on scuba diver and snorkeler's damaging behavior will be important for efforts aimed at reducing the impacts created by these resource users. These factors all have the ability to exert some form of influence on user behavior, either individually, or collectively. Determining the amount of influence these factors exert can facilitate the design of interventions needed to reduce the damaging visitor behaviors. However, it is also important to determine how much control scuba divers/snorkelers have over their behavior as some of these variables may reduce that control. If the damaging behavior of the recreational users is volitional, how important are these factors in influencing their decisions?

2.1.2. Aims of this Study

Scuba diving and snorkeling are popular pastimes globally, and the Mombasa Marine Park and Reserve (Kenya) offers an ideal setting for these activities. This chapter examines the behavior of scuba divers and snorkelers to determine if it has a negative impact on the environment. Identifying which factors can influence visitor impacts will assist in deciding management options. By understanding what constitutes scuba diving and snorkeling behavior, and where management efforts could have their greatest effect, more efficient efforts can be realized to minimize negative impacts by scuba divers and snorkelers. The research questions are:

1. What potentially damaging behavior do scuba divers and snorkelers undertake in the Mombasa Marine Park and Reserve?
2. How do personal, environmental and situational variables influence potentially damaging interactions on the reef by scuba divers and snorkelers?
3. In what ways are the scuba diving/snorkeling behavior of visitors similar to the behavior of the diving/snorkeling guides?

Understanding the behavior of scuba divers and snorkelers will facilitate in designing management options aimed at influencing their behavior to make it less damaging to the environment and thereby assist with resource management. This research will provide the necessary groundwork for additional elements of the research (*Chapter 4*).

2.2. Methodology

2.2.1. Overview of Methods

This study was conducted in the Mombasa Marine Park and Reserve, Kenya. The scuba diving excursions frequented both lagoonal and outer reef sites as part of their daily excursions. All data collection with the scuba diving excursions were gathered on the outer reef trips. The snorkeling excursions only frequented patch reefs within the lagoon of the park. The methods involved gathering data by monitoring the scuba divers and snorkelers during their dive/snorkel excursion. Their interactions with the coral reef substrate (number and types of contacts with the reef) were recorded.

PART A: SCUBA DIVER BEHAVIOR

2.3. Methods: Scuba Divers

2.3.1. Scuba Diver Behavior

Scuba diver behavior was observed during dive excursions by the researcher (in scuba gear) following the scuba divers in the water at a distance of 2-3m for the duration of the scuba dive. The scuba divers were not informed that they would be monitored to avoid any non-natural behavior of the divers. The monitoring started 3 minutes after the scuba divers began their descent from the surface. This delay of three minutes was necessary as not all scuba divers descended together, or quickly, or occasionally the divers descended onto the reef top and needed 1-2 minutes to reach the slope of the reef where they would begin swimming along the reef with the current. The 3-minute waiting period was thus necessary to ensure that all scuba divers were monitored during the same portion of their scuba dives. The monitoring of the scuba divers stopped when either 45 minutes of monitoring time had been achieved (dive time of 48 minutes), or a diver initiated an ascent to the surface. Efforts were made to maximize data collection of as many divers as possible. When not all scuba divers ascended together (if one diver was low on air, but the remaining divers had sufficient air to continue) the dive group was split up and the researcher stayed with the remaining divers to continue monitoring the behavior of those divers. The average scuba dive in the Mombasa Marine Park and Reserve is 45 minutes (this is derived from the researcher having worked in the Mombasa scuba diving industry for five years), however, as not all scuba divers were able to complete a 45-minute dive (due to air consumption) only the first 30 minutes of the scuba dive were used in the analysis. The monitoring of the scuba dive behavior for the duration of the dive was divided into three 15-minute monitoring segments. For data analysis, only the first two 15-minute periods (first and second 15-minute periods of the scuba dive) were used to arrive at the monitoring time of 30 minutes.

Six separate actions were measured (Table 2.1: first column) and these were subsequently reduced to two different behavior categories (right-hand columns) for analysis. The behavior definitions are shown in Table 2.2. Reef substrate contacts (either intentional or non-intentional and either on living or dead substrate) were grouped together with the ‘near’ category (collectively referred to as ‘near combined’). A ‘near’ interaction is defined as any time a diver, or his/her equipment, comes within 10cm of the reef substrate, regardless how long the proximity lasted. The researcher approximated the 10cm distance. Observations from pilot monitoring data revealed that most scuba divers come near to the reef substrate while diving yet may or may not touch it. This is not a contact with the reef substrate, however, any placement of the scuba diver's fins, arms, or diving equipment (gauges, cameras, hoses) within 10cm of the reef substrate can become a contact, whether intentional or non-intentional. It was therefore decided to examine the category of 'near combined' for most of the analysis. The scuba diving behavior of the guides was also monitored, in the same manner as described above, to assist with understanding the behavior of scuba divers. Inferred decisions were made to label behaviors as either intentional or non-intentional based on how the diver/guide made the behavior and the surrounding context. All behavior actions were recorded on an underwater slate by the researcher (see monitoring slate template in *Appendix 4*).

Table 2.1. Behavior matrix showing the six measured actions (contacts: 1st column) and the two behavior categories used for analysis (right side of table: near combined and sedimentation).

Contact	Near combined	Sedimentation
Alive Intentional Contacts	✔	
Alive Non-intentional Contacts	✔	
Dead Intentional Contacts	✔	
Dead Non-intentional Contacts	✔	
Sedimentation		✔
Near (within 10cm of the reef)	✔	

Table 2.2. Definitions of actions for monitoring of scuba divers (scored per single occurrence).

Item	Definition
Alive Intentional	Anytime a scuba diver intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Alive Non-intentional	Anytime any part of a scuba diver's body or an extension thereof (fins, camera, etc.) comes into contact with living substrate that the individual did not plan or was unaware of.
Dead Intentional	Anytime a scuba diver intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with non-living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Dead Non-intentional	Anytime any part of a scuba diver's body or an extension thereof (fins, camera, etc.) comes into contact with non-living substrate that the individual did not plan or was unaware of.
Sedimentation	Anytime a scuba diver makes a movement with a limb (arm or leg) that results in sediment becoming suspended in the water (creating a dust cloud).
Near	Anytime a scuba diver comes within 10cm of the reef substrate

Alive Substrate: Any living substrate excluding algal species and plant species. Examples include: sponges, corals, fish.

Dead Substrate: Any non-living substrate including algal species and plant species. Examples include: living rock, macro algae.

Environmental variables that could have influenced scuba diver behavior were also collected, including: cloud coverage, current strength, underwater horizontal visibility, and the presence/absence of surge. The researcher examined the sky directly prior to a dive and determined cloud coverage by examining how many "$^{1}/_{8}$'s" of the sky was covered by clouds. The underwater current present throughout the dive was assigned to a category of weak, average or strong by the researcher. The underwater horizontal visibility was estimated by the researcher at the start of every monitoring dive. Surge was defined as the to-and-fro movement of water causing the diver to be displaced during the dive. The researcher noted if surge was present/absent throughout the dive.

The researcher recorded data on various personal variables: the certification level of scuba divers, number of dives the scuba diver has made, and, date of last scuba dive in relation to the day of the monitored dive. The researcher recorded several situational variables: the number of divers in the group during the scuba dive excursion, the dive site, whether the monitored dive was the first or second dive of the double dive excursion, and, the dive guide leading the scuba dive excursion.

Some of the variables needed to be grouped into categories and recoded so as to run the statistical tests to avoid empty cells for the chi-square tests: visibility was a continuous variable but was recoded into an ordinal variable resulting in three visibility groups (0-5m, 6-10m and +10m); date of last dive was recoded into an ordinal variable with five date groups; and, number of divers was recoded into an ordinal variable of four different groups.

2.3.2. Sample Size

The sample size of the monitored scuba divers consisted of 192 individual diving participants. Some data regarding a diver's history were missing for some of the participants.

The sample size of the monitored scuba diving guides consisted of 71 individual guides. Information regarding the certification level, the number of dives completed by the guide and the date of the last scuba dive prior to the date of monitoring was not recorded (they were all divemasters or higher with at least 500 dives, personal observation).

2.3.3. Statistical Analysis

To determine the effect of personal, environmental, and/or situational variables on scuba diver behavior, chi-square tests and independent samples t-tests were used to indicate differences between scuba divers and guides, and also between scuba divers of different groups (as determined by the variables). The independent samples t-test was used as it is a robust test regarding the assumption of normality, especially with sample sizes larger than 50. Some of the variables with numerous response options needed to be grouped into categories and recoded so as to run the statistical tests to avoid empty cells for the chi-square tests: date of last dive was recoded into an ordinal variable with five date groups; and, number of divers was recoded into an ordinal variable of four different groups. Linear regression was used to determine the influence of the following environmental variables on scuba diver behavior: underwater visibility, cloud coverage, surge and current.

2.4. Results: Scuba Divers

2.4.1. Scuba Diver Behavior of Divers and Guides

Figure 2.2 displays the different types of contacts made by the scuba divers and guides during the first 30 minutes of the scuba dive. Most interactions were 'near' interactions. There was no significant difference between the behaviors of the scuba divers and guides for all the behaviors except that of non-intentional contacts on living substrate (Alive non-intentional; independent samples t-test, p=0.017, n=185 and 69 for divers and guides respectively). The divers had more non-intentional contacts on living reef substrate.

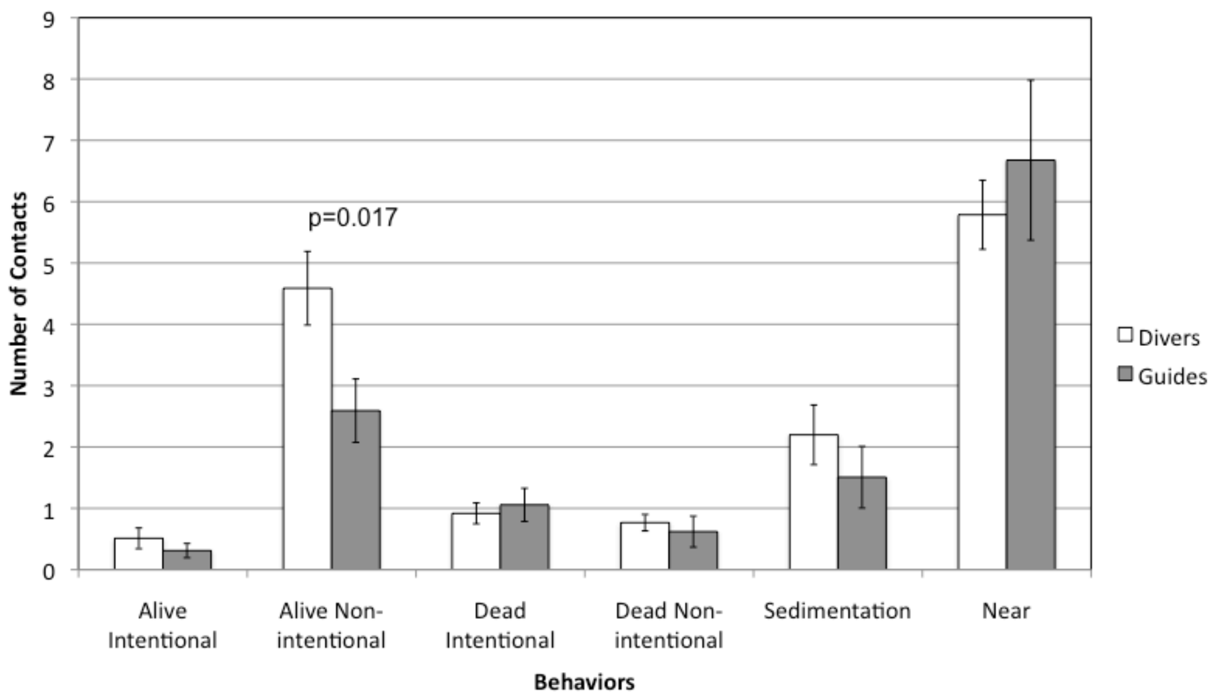


Figure 2.2. Number of contacts made by scuba divers and guides during the first 30 minutes of the scuba dive for the different behaviors monitored (standard error of the mean indicated). Significant differences between two groups are indicated by the p-value in the figure.

The remaining analysis was performed by examining the number of 'near combined' interactions for the scuba divers and guides. The percentage of 'near combined' interactions (shown in number of contacts groups) made by scuba divers and guides in the first 30 minutes of a scuba dive are depicted in Figure 2.3. More than 80% of all divers and guides came within 10 cm of the reef substrate (or contacted the reef substrate) during the first 30 minutes of the scuba dive. No significant differences existed between the 'near combined' interactions made by the scuba divers and the guides (independent samples t-test, p=0.652, n=185 and 69 for divers and guides respectfully).

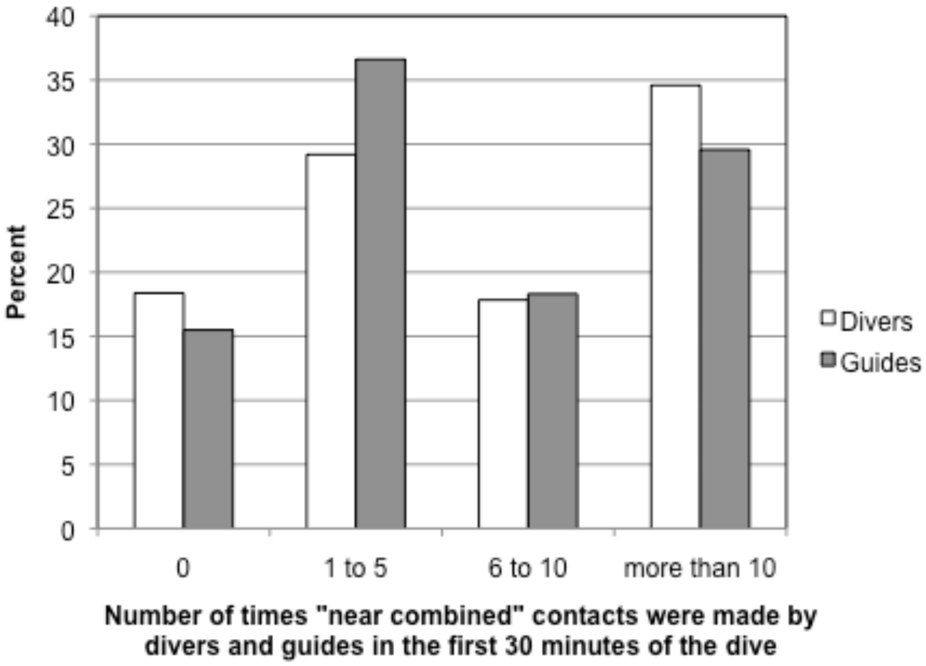


Figure 2.3. The percentage of 'near combined' interactions made by scuba divers (n=185) and guides (69) during the first 30 minutes of the scuba dive shown per number of contacts group.

2.4.2. What Affects the Contacts of Scuba Divers: Personal Factors

Personal factors were examined to determine if they influenced the diving behavior of scuba divers: number of dives completed, certification level and date of last scuba dive prior to being monitored. There was a weak negative correlation between the number of dives a scuba diver has made and the number of 'near combined' interactions (increase in dives results in a decrease of contacts) they made during the first 30 minutes of a scuba dive (Figure 2.4; Pearson's correlation coefficient= −0.101, n=95, regression line indicated). When all dives over 300 were excluded from the analysis the correlation was slightly stronger, but still weak (Pearson's correlation coefficient= −0.282, n=78).

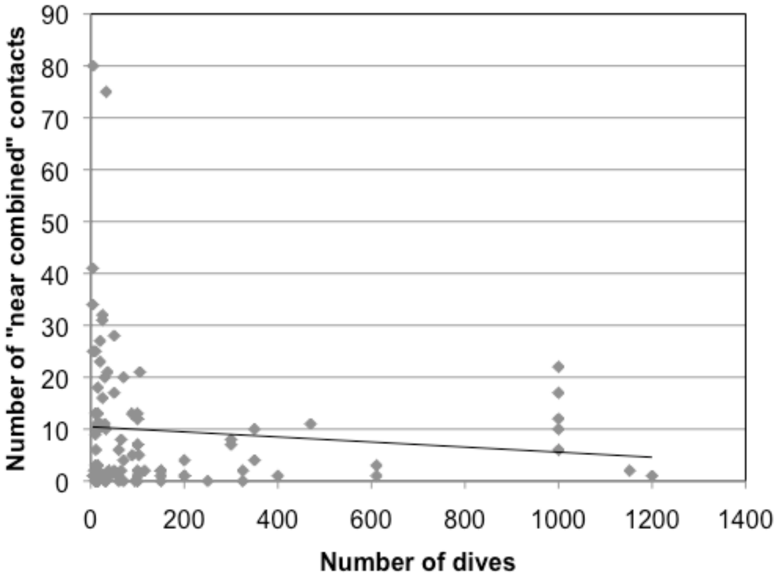


Figure 2.4. The number of 'near combined' interactions made by a scuba diver during the first 30 minutes of the scuba dive in relation to the number of scuba dives that individual has made (n=95).

Figure 2.5 indicates that as a scuba diver's certification level increased, the number of 'near combined' interactions decreased until the certification level of divemaster, after which they increased again. Table 2.3 presents the number of 'near combined' interactions during a dive of each certification compared to each of the other certifications. Every certification differed significantly from the Divemaster certification level (independent samples t-tests).

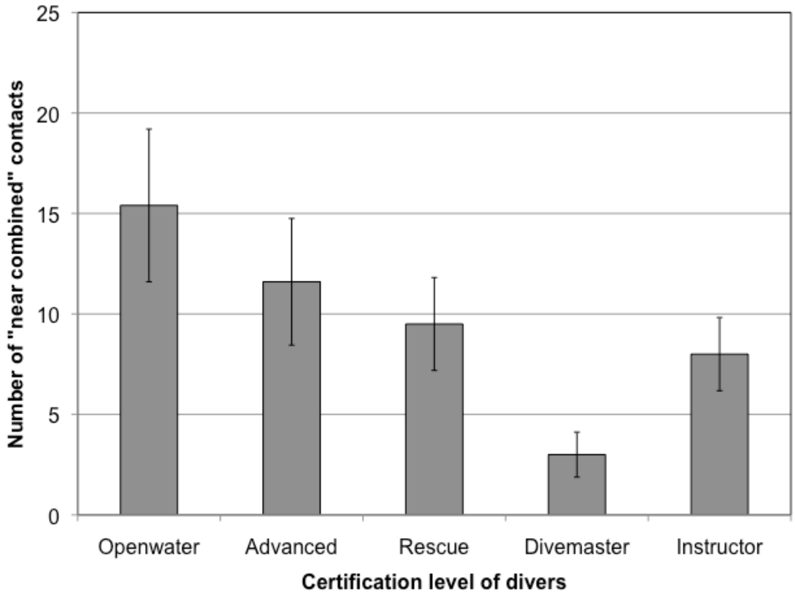


Figure 2.5. The average number of 'near combined' interactions made by scuba divers during the first 30 minutes of the scuba dive of different certification levels (standard error of the mean indicated; n=105).

Table 2.3. The comparisons of the number of 'near combined' interactions made by scuba divers during the first 30 minutes of the scuba dive of one certification level compared to other certification levels (independent samples t-test, not significant refers to p>0.05, sample sizes are indicated in the table; x=no comparison, ns=non-significant).

Certification	Openwater	Advanced	Rescue	Divemaster
Openwater (n=31)	x	x	x	x
Advanced (n=36)	ns	x	x	x
Rescue (n=16)	ns	ns	x	x
Divemaster (n=8)	0.004	0.014	0.020	x
Instructor (n=14)	ns	ns	ns	0.032

The number of months since the scuba diver's last dive vs. the number of contacts is presented in Figure 2.6. Statistical analysis was attempted on this data but due to the large contingency table and low representation of counts within most of the cells the statistical tests did not yield any usable results.

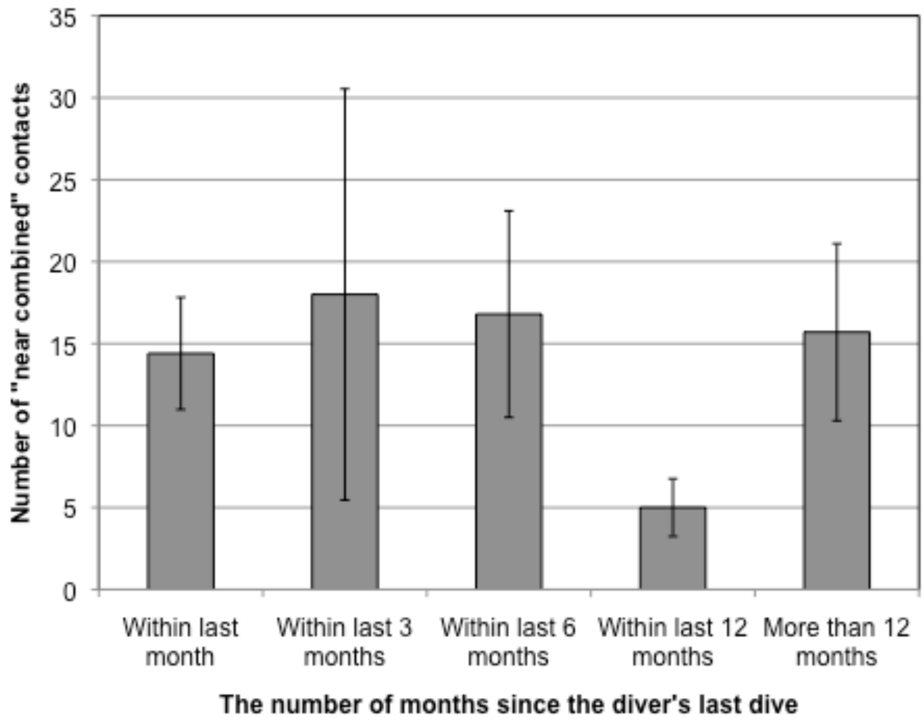


Figure 2.6. The number of ‘near combined’ interactions made by scuba divers during the first 30 minutes of the scuba dive in relation to the number of months since their last scuba dive (standard error of the mean indicated, n=60).

A linear regression was completed on these three independent variables: certification level, number of scuba dives and date of last scuba dive. The dependent variable was number of ‘near combined’ interactions (Table 2.4). The full model was statistically significant, ANOVA sum of squares (df=3, F=3.652, n=106)=2627.263, p=0.019, and it shows that the number of scuba dives an individual has was the only variable to significantly influence the number of ‘near combined’ interactions, demonstrating a negative relationship between the two variables.

Table 2.4. Linear regression table of ‘near combined’ interactions made by the scuba divers on three independent variables: certification level, number of dives and date of last dive. Sample size 106 divers.

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	31.925	6.955		4.590	0.000
Certification	1.307	2.377	0.107	0.550	0.585
Number of dives	-5.867	2.278	-0.513	-2.575	0.013
Date of last dive	-1.611	1.443	-0.148	-1.116	0.270

a. Dependent Variable: near touches

b. Model Information: R-square=0.180, df=3, F=3.652 and sig=0.019

2.4.3. What Affects the Contacts of Scuba Divers and Guides: Environmental Factors

The influence of visibility on the number of ‘near combined’ interactions with the reef during the first 30 minutes of the scuba dive for divers and guides was non-significant within each category of visibility (Figure 2.7; independent samples t-test, sample sizes and p-values are shown in Table 2.5). There was also no significant difference between the different visibility categories for the scuba divers (chi-square test, df=6, p=0.365, n=185; contingency table=3 categories of visibility vs. 4 categories of near contacts). Statistical analysis was attempted on the guide data but due to the large contingency table and low representation of counts within most of the cells the statistical tests did not yield any usable results. There existed a weak correlation between the visibility and the number of ‘near combined’ interactions made by the scuba divers (Spearman’s correlation coefficient= −0.111) and the guides (Spearman’s correlation coefficient= −0.058).

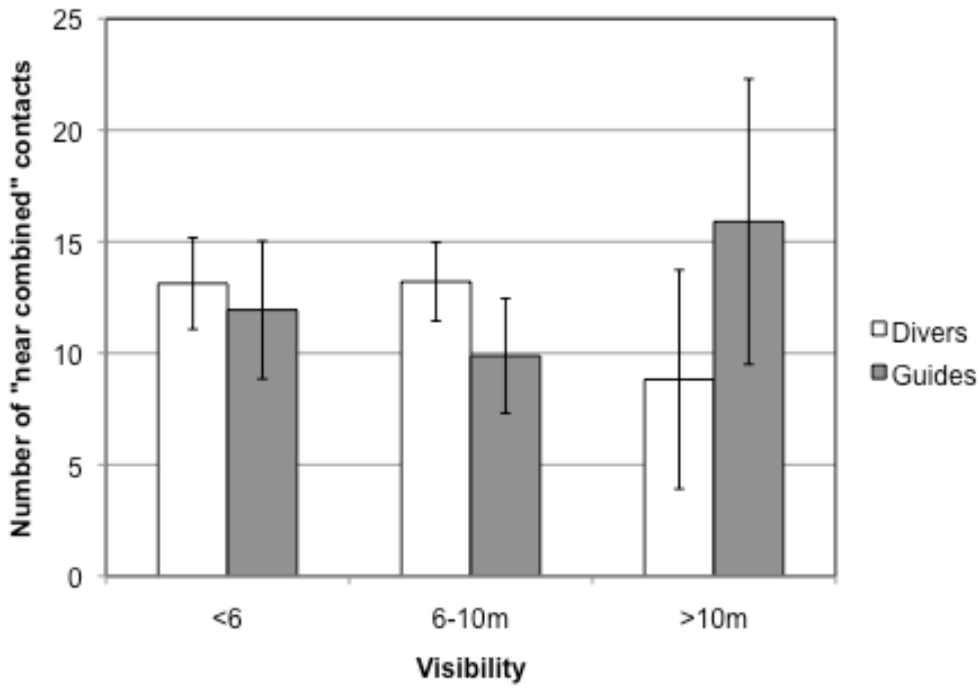


Figure 2.7. The average number of ‘near combined’ interactions made by scuba divers (n=185) and guides (n=69) during the first 30 minutes of a scuba dive in relation to three visibility categories (standard error of the mean indicated).

Table 2.5. The sample sizes of the scuba divers and the guides for each visibility category and the p-values comparing the number of ‘near combined’ interactions at each site between the two groups (independent samples t-test).

Visibility Category	Sample Size Scuba Divers	Sample Size Guides	p-value
0-5 meters	52	16	0.907
6-10 meters	116	43	0.313
+10m	17	10	0.389

A linear regression was completed to determine if the following environmental variables had an effect on the number of 'near combined' interactions for the scuba divers (Table 2.6) and for the guides (Table 2.7): presence/absence of surge, current strength, cloud coverage and underwater horizontal visibility. The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=0.430, n=185)=576.151, p=0.787. None of the variables within the model were significant.

Table 2.6. Linear regression table of 'near combined' interactions by scuba divers on four independent variables: cloud coverage, current strength, visibility and the presence/absence of surge. Sample size 185.

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	14.417	5.220		2.762	0.006
Cloud Cover	-0.485	0.577	-0.063	-0.842	0.401
Current	0.485	1.752	0.021	0.277	0.782
Visibility	-0.180	0.440	-0.031	-0.408	0.684
Surge	2.410	3.416	0.055	0.706	0.481

a. Dependent Variable: near contacts

b. Model Information: R-square=0.009, df=4, F=0.430 and sig=0.787

The model for the guides contained four independent variables (cloud coverage, current, visibility and surge; Table 2.7). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=0.177, n=71)=200.065, p=0.950.

Table 2.7. Linear regression table of 'near combined' interactions by guides on four independent variables: cloud coverage, current strength, visibility and the presence/absence of surge. Sample size 71.

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	6.118	8.355		0.732	0.467
Cloud Cover	-0.018	0.852	-0.003	-0.021	0.983
Current	1.073	2.573	0.053	0.417	0.678
Visibility	0.426	0.616	0.089	0.691	0.492
Surge	1.320	5.065	0.033	0.261	0.795

a. Dependent Variable: near contacts

b. Model Information: R-square=0.011, df=4, F=0.177 and sig=0.950

2.4.4. What Affects the Contacts of Scuba Divers and Guides: Situational Factors

The following situational factors were analyzed: first dive vs. second dive, dive site and number of divers present in dive group. The differences between the behavior of the divers of different groups were investigated (e.g., diver behavior of those in the first dive compared to diver behavior of those in the second dive) and the differences between the behavior of the divers and the guides in each group (e.g., diver behavior of those in the first dive compared to guide behavior of those in the second dive). Each scuba dive excursion consisted of two scuba dives and scuba divers/guides were monitored once on either the first or second dive. To determine if there was a difference between the number of 'near combined' interactions made during the first or second dive of the double dive excursion, an independent samples t-test was used for the scuba divers and guides (Figure 2.8). The results were non-significant for the scuba divers ($p=0.938$, $n=103$ and $n=82$ for the first and second scuba dive respectively) and for the guides ($p=0.922$, $n=45$ and $n=24$ for the first and second scuba dive respectively).

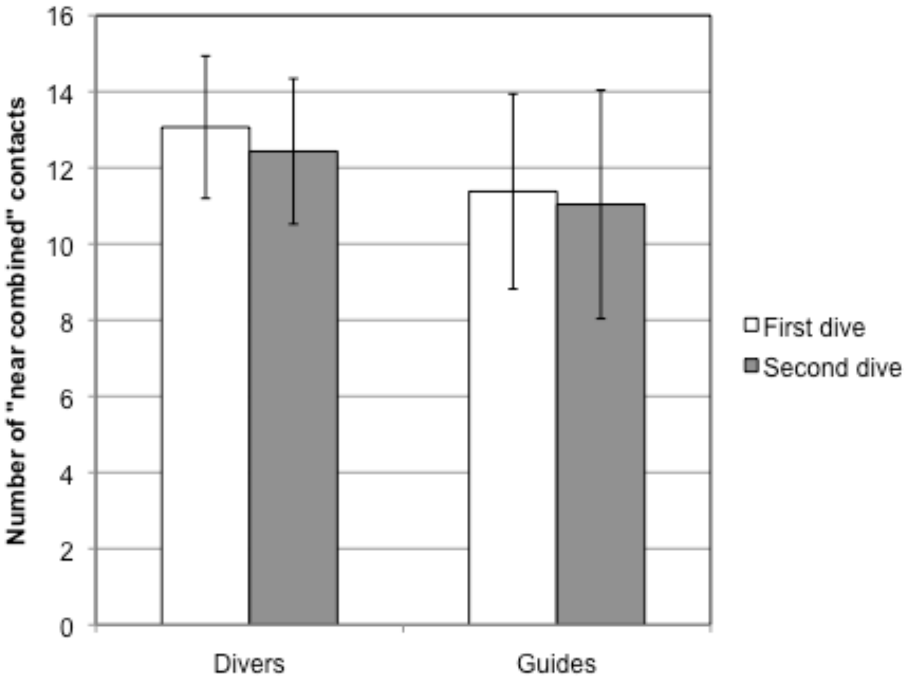


Figure 2.8. The average number of 'near combined' interactions made by scuba divers (n=185) and guides (n=69) during the first 30 minutes of a scuba dive on either the first or second dive of a double dive excursion (standard error of the mean indicated).

Table 2.8 reveals that no significant differences existed between the 'near combined' interactions made by the scuba divers on either the first dive or second dive for the first 15 minutes of the dive, the second 15 minutes of the dive and for the first 30 minutes of the dive (independent samples t-test). The table also shows the same for the dive guides.

Table 2.8. The number of 'near combined' interactions made by the divers and the guides on the first or second dive (independent samples t-test).

Period of the dive	Sample Size Scuba Divers	Sample Size Guides	p-value
1st Dive: 1st 15 min	105	45	0.306
1st Dive: 2nd 15 min	107	45	0.852
1st Dive: 30 minutes	107	45	0.660
2nd Dive 2: 1st 15 min	85	25	0.921
2nd Dive: 2nd 15 min	85	26	0.593
2nd Dive: 30 minutes	85	26	0.747

Figure 2.9 presents the number of 'near combined' interactions made by the scuba divers and guides within the first 30 minutes of the scuba dive at each of the dive sites. There were no significant differences between the scuba divers and guides at each dive site (Table 2.9).

Statistical analysis was attempted on the data to determine if a difference existed between the different dive sites for the scuba divers, and for the guides, but due to the large contingency table and low representation of counts within most of the cells the statistical tests did not yield any usable results.

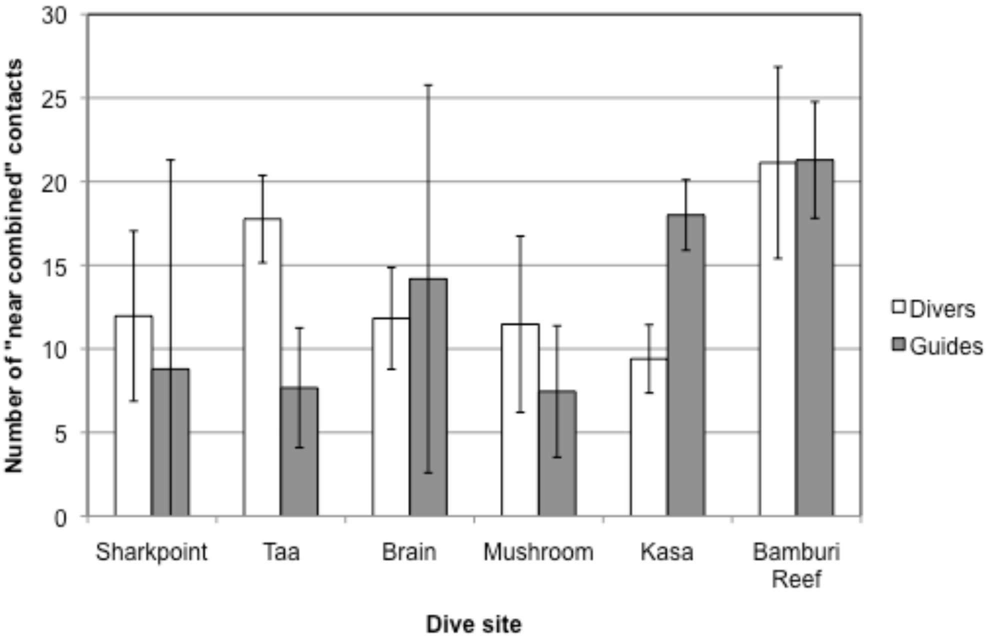


Figure 2.9. The average number of 'near combined' interactions made by scuba divers (n=185) and guides (n=69) during the first 30 minutes of the scuba dive at each dive site (standard error of the mean indicated).

Table 2.9. The sample sizes of the scuba divers and the guides at each dive site and the p-values comparing the number of 'near combined' interactions at each site between the two groups (independent samples t-test).

Dive Site	Sample Size Scuba Divers	Sample Size Guides	p-value
Sharkpoint	80	34	0.356
Taa	18	3	0.523
Brain	28	11	0.622
Mushroom	20	11	0.589
Kasa	30	5	0.331
Bamburi Reef	16	7	0.989

Figure 2.10 indicates the average number of 'near combined' interactions for the scuba divers and guides during the first 30 minutes of the scuba dive in relation to the number of divers that were in the dive group. For the divers there was no significant difference between the different average contacts and the number of scuba divers in the group (chi-square test, df=9, p=0.089,

n=185; contingency table=4 categories of divers in group vs. 4 categories of near contacts). Statistical analysis was attempted on the guide data but due to the large contingency table and low representation of counts within most of the cells the statistical tests did not yield any usable results.

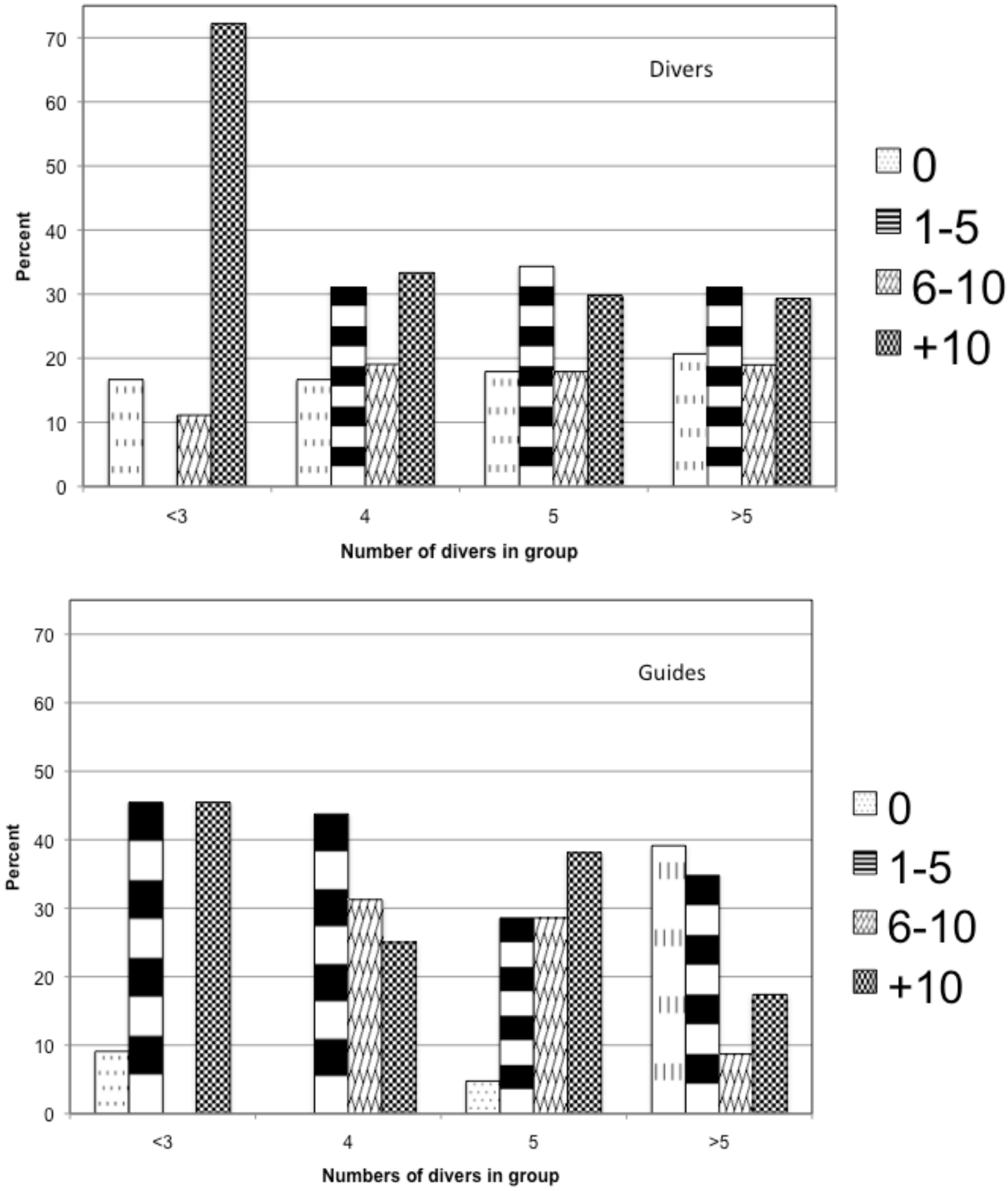


Figure 2.10. The percentage of average number of 'near combined' interactions made by scuba divers (top figure, n=185) and guides (bottom figure, n=71) during the first 30 minutes of a scuba dive in relation to the number of divers in the dive group (standard error of the mean indicated).

2.4.5. First 15-minutes vs. the Second 15-minutes of the Scuba Dive: Divers

The first 15 minutes of the scuba dive were compared to the second 15 minutes of the scuba dive for the different variables. When the percentage of 'near combined' interactions was compared for the first and second 15 minutes of the scuba dive, it was evident that in the second 15-minute period there were fewer contacts with the reef (Figure 2.11). Significant differences exist for the following groups of contacts (chi-square test, df=1, n=190 for first 15 minutes and n=187 for second 15 minutes; contingency table=2 categories of near contacts vs. 2 15-minute periods): 0 (p=0.000), 6-10 (p=0.003) and +10 (p=0.048). The 1-5 contacts group was non-significant (p=0.830).

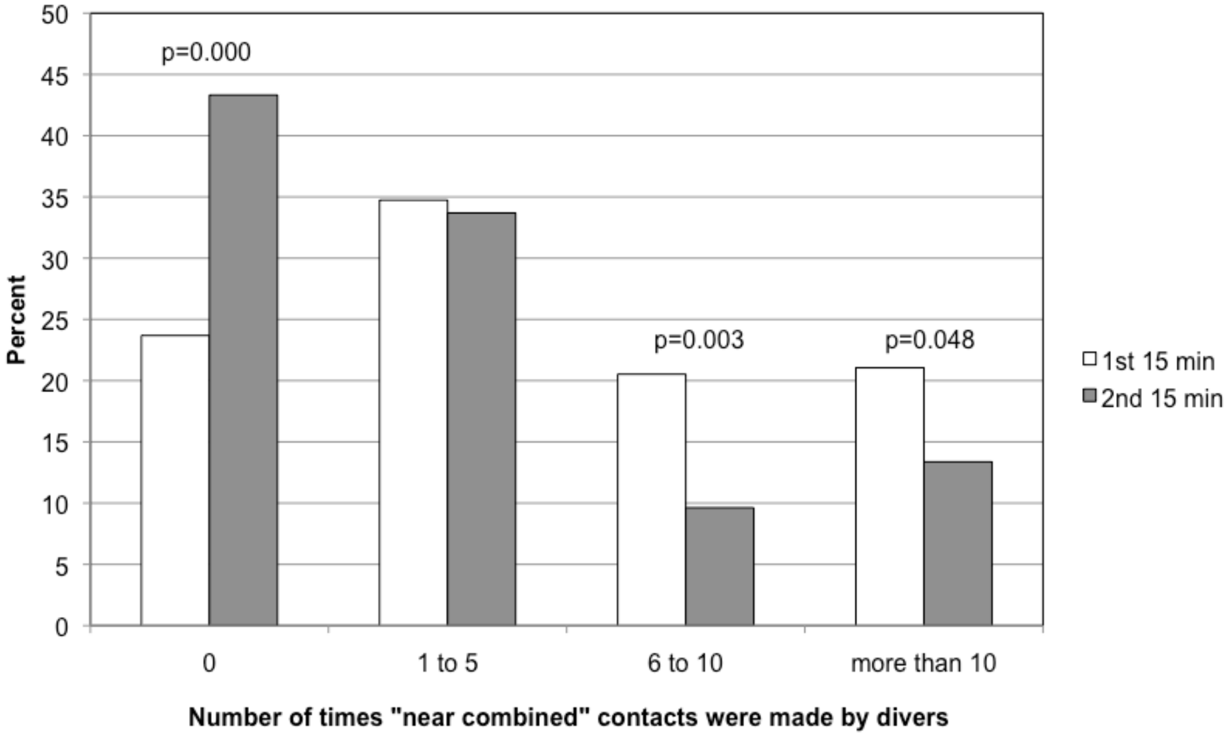


Figure 2.11. The percentage of 'near combined' interactions made by scuba divers in the first and second 15-minute periods of the scuba dive shown per number of contacts group (n=190). Significant differences between two groups are indicated by the p-value in the figure.

The scuba divers in most of the total dives groups made fewer 'near combined' interactions in the second 15-minute period compared to the first (Figure 2.12). The only exception was the last category of total dives made by the scuba diver. In this category the number of contacts in both 15-minute periods was equal. Significant differences exist between the first and second 15-minute periods for the group of 11-25 dives (paired samples t-test, p-values and sample sizes displayed in Table 2.10).

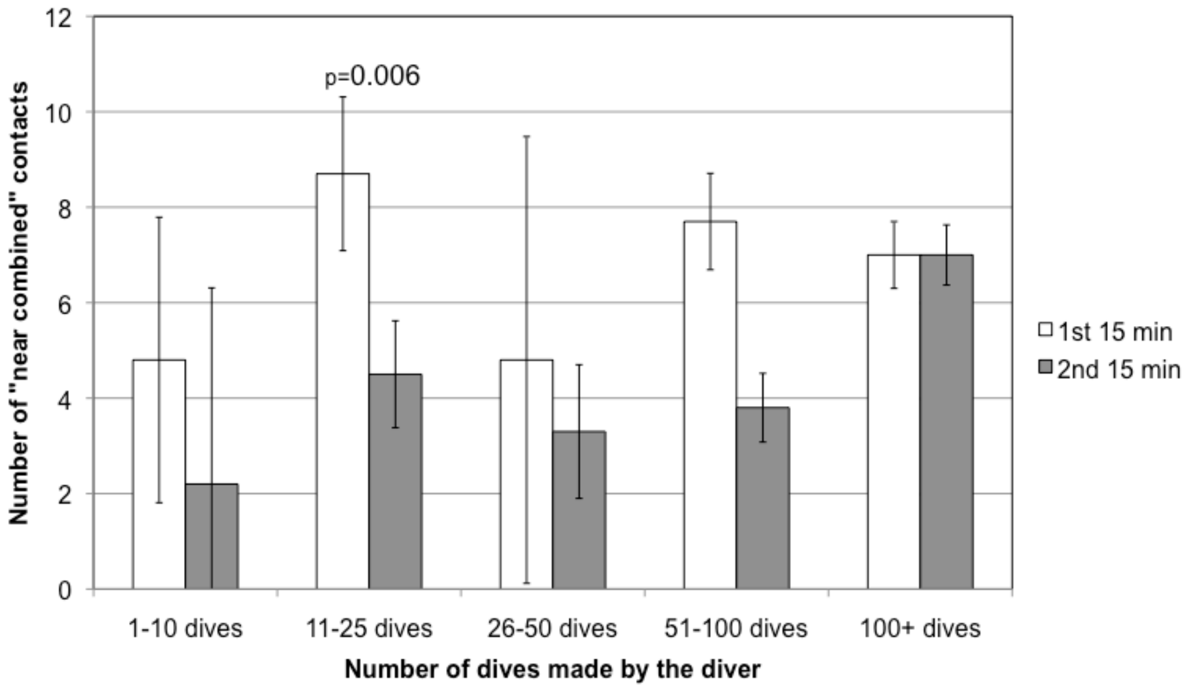


Figure 2.12. The average number of 'near combined' interactions made by scuba divers in the first and second 15-minute periods of the scuba dive in relation to the number of scuba dives that individual has made (standard error of the mean indicated, n=95). Significant differences between two groups are indicated by the p-value in the figure.

Table 2.10. The sample sizes of the scuba divers for the first and second 15-minute periods of the scuba dive per total number of dives category and the p-values comparing the number of 'near combined' interactions per category between the two groups (paired samples t-test).

Total Number of Dives	Number of Pairs	p-value
1-10	14	0.474
11-25	19	0.006
26-50	14	0.155
51-100	20	0.155
+100	28	0.079

Figure 2.13 shows that for all the different certification levels the number of 'near combined' interactions decreased from the first 15-minute period to the second 15-minute period. There was only one significant difference (openwater certification) between the number of 'near combined' interactions in the first and second 15-minute periods of the different certifications (paired samples t-test, p-values and sample sizes indicated in Table 2.11).

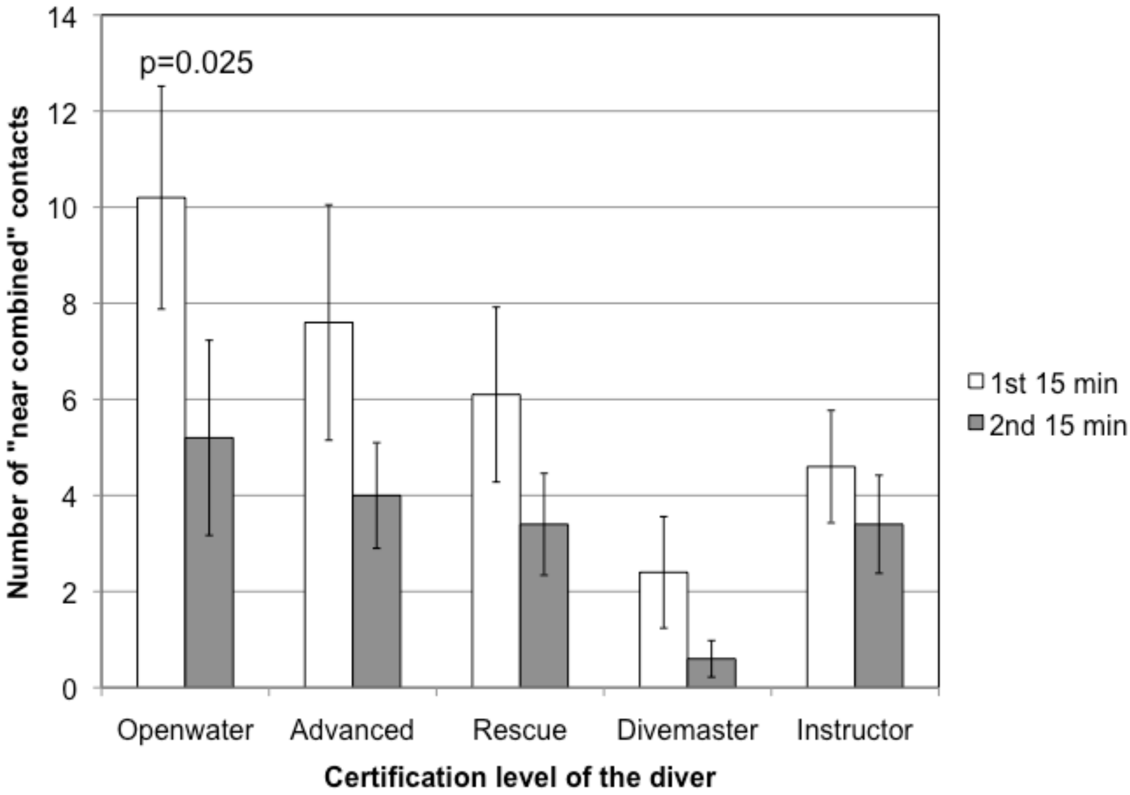


Figure 2.13. The average number of 'near combined' interactions made by scuba divers in the first and second 15-minute periods of the scuba dive of different certification levels (standard error of the mean indicated, n=105). Significant differences between two groups are indicated by the p-value in the figure.

Table 2.11. The sample sizes of the scuba divers for the first and second 15-minute periods of the scuba dive per certification level and the p-values comparing the number of 'near combined' interactions for each certification between the two groups (paired samples t-test).

Certification Level	Number of Pairs	p-value
Openwater	31	0.025
Advanced	36	0.095
Rescue	16	0.165
Divemaster	8	0.226
Instructor	14	0.342

The number of 'near combined' interactions in the first 15 minute period of the scuba dive was similar for both the first or second dive of a double dive excursion (independent samples t-test, p=0.172, n=105 for first dive and 85 for second dive). The second 15 minutes of the dive of both dives was similar (independent samples t-test, p=0.087, n=105 for first dive and 82 for second dive). The difference between the number of 'near combined' interactions in the first 15 minutes compared to the second 15 minutes was significantly different between the first and second dives in that the difference was smaller in the second dive (independent samples t-test, p=0.008, n=103 for first dive and 82 for second dive). The difference between the first 15 minutes and second 15 minutes of the first scuba dive was also significant (Figure 2.14; paired samples t-test, p=0.000, n=103 pairs) as was the same comparison for the second dive (paired samples t-test, p=0.037, n=82 pairs).

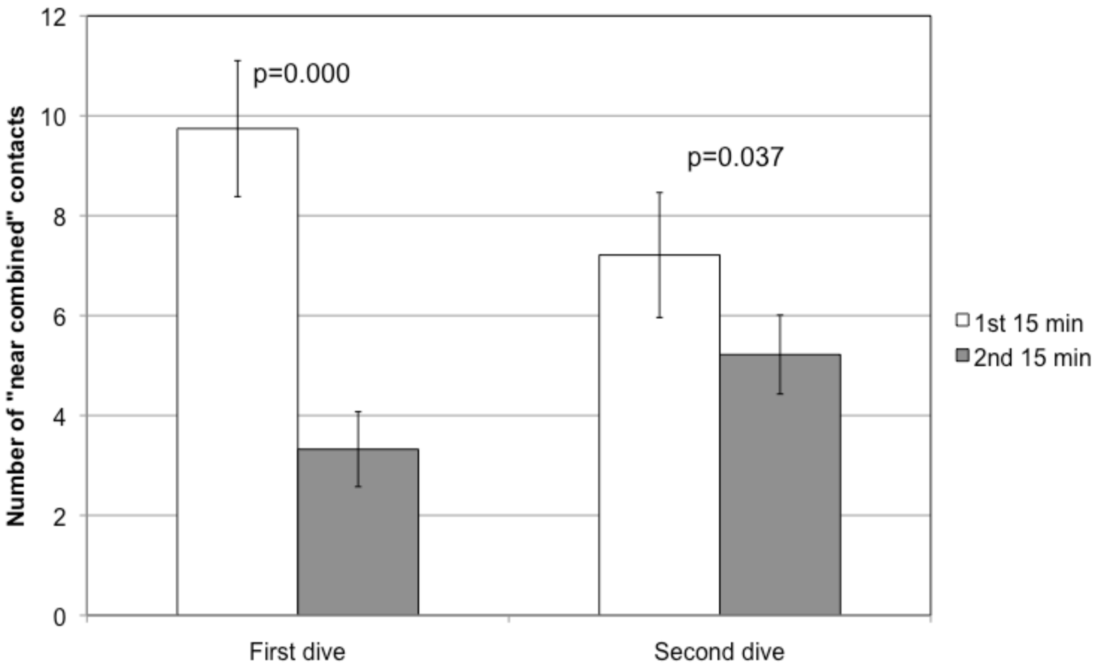


Figure 2.14. The average number of 'near combined' interactions made by scuba divers in the first and second 15-minute periods on the first or second dive of a double dive excursion (standard error of the mean indicated, n=190). Significant differences between two groups are indicated by the p-value in the figure.

All dive sites showed fewer contacts in the second 15 minutes compared to the first 15 minutes of the scuba dive (Figure 2.15), yet these were not all significantly different (paired samples t-test, p-values and sample sizes indicated in Table 2.12).

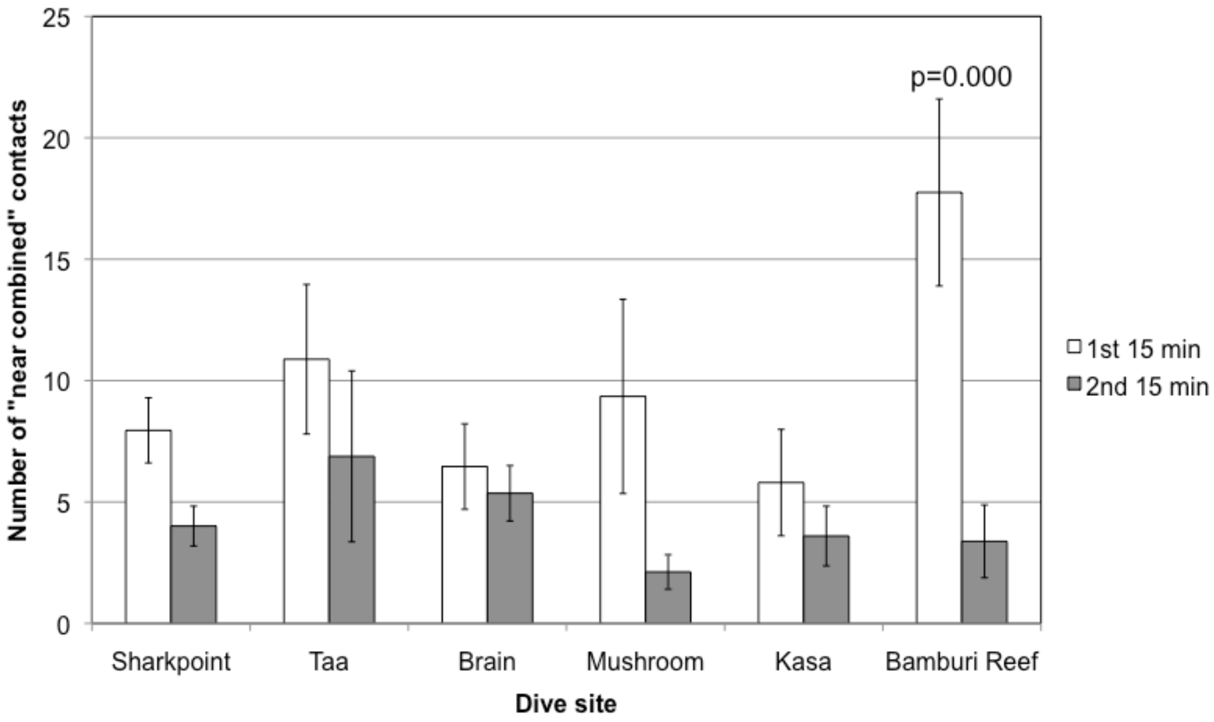


Figure 2.15. The average number of 'near combined' interactions made by scuba divers in the first and second 15-minute periods of the scuba dive at different dive sites (standard error of the mean indicated, n=185). Significant differences between two groups are indicated by the p-value in the figure.

Table 2.12. The sample sizes of the scuba divers for the first and second 15-minute period of the scuba dive per dive site and the p-values comparing the number of 'near combined' interactions at each site between the two groups (paired samples t-test).

Dive Site	Number of Pairs	p-value
Sharkpoint	80	0.000
Taa	14	0.708
Brain	28	0.434
Mushroom	17	0.069
Kasa	30	0.240
Bamburi Reef	16	0.000

When the variable of visibility was compared to the number of 'near combined' interactions per 15-minute period of the scuba dive it was evident that there were again fewer contacts in the second 15-minute period compared to the first 15-minute period (Figure 2.16), however, these were not all significantly different (paired samples t-test, p-values and sample sizes indicated in Table 2.13).

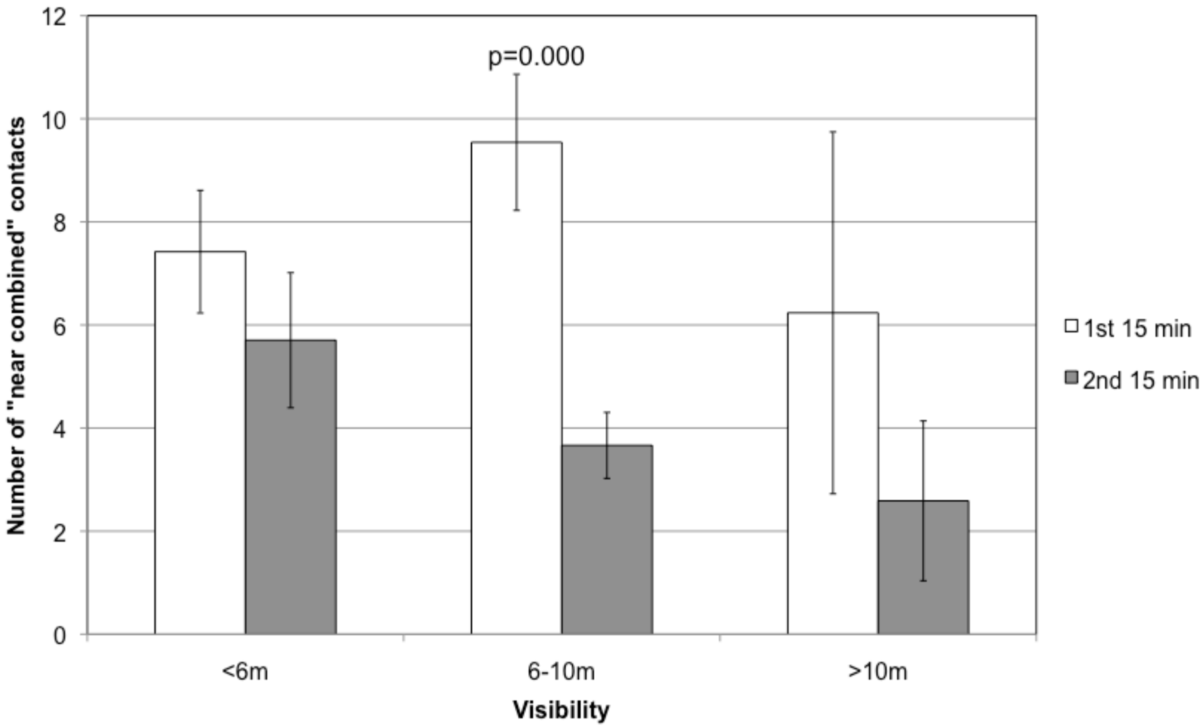


Figure 2.16. The average number of ‘near combined’ interactions made by the scuba divers in the first and second 15-minute periods of a scuba dive in relation to three visibility categories (standard error of the mean indicated, n=185). Significant differences between two groups are indicated by the p-value in the figure.

Table 2.13. The sample sizes of the scuba divers for the first and second 15-minute periods of the scuba dive per visibility category and the p-values comparing the number of ‘near combined’ interactions in each category between the two groups (paired samples t-test).

Visibility Category	Number of Pairs	p-value
0-5 meters	52	0.324
6-10 meters	116	0.000
+10 meters	17	0.349

2.4.6. First 15 minutes vs. the Second 15 minutes of the Scuba Dive: Guides

There were fewer ‘near combined’ interactions made by the guides in the second 15-minute period compared to the first 15-minute period of the scuba dive (Figure 2.17). The ‘0’ contacts group was the only group that differed significantly between contacts made in the first 15 minutes of the dive compared to the second 15 minutes of the dive. Guides in the first 15 minutes of the dive had fewer zero contacts compared to the second 15 minutes (chi-square test, df=1, p=0.029, n=70 for first 15 minutes and 70 for second 15 minutes; contingency table=2 categories of near contacts vs. 2 15-minute periods). The p-values for the remaining number of contacts groups are: p=0.73 (group 1-5), p=0.313 (group 6-10) and p=0.164 (+10 group).

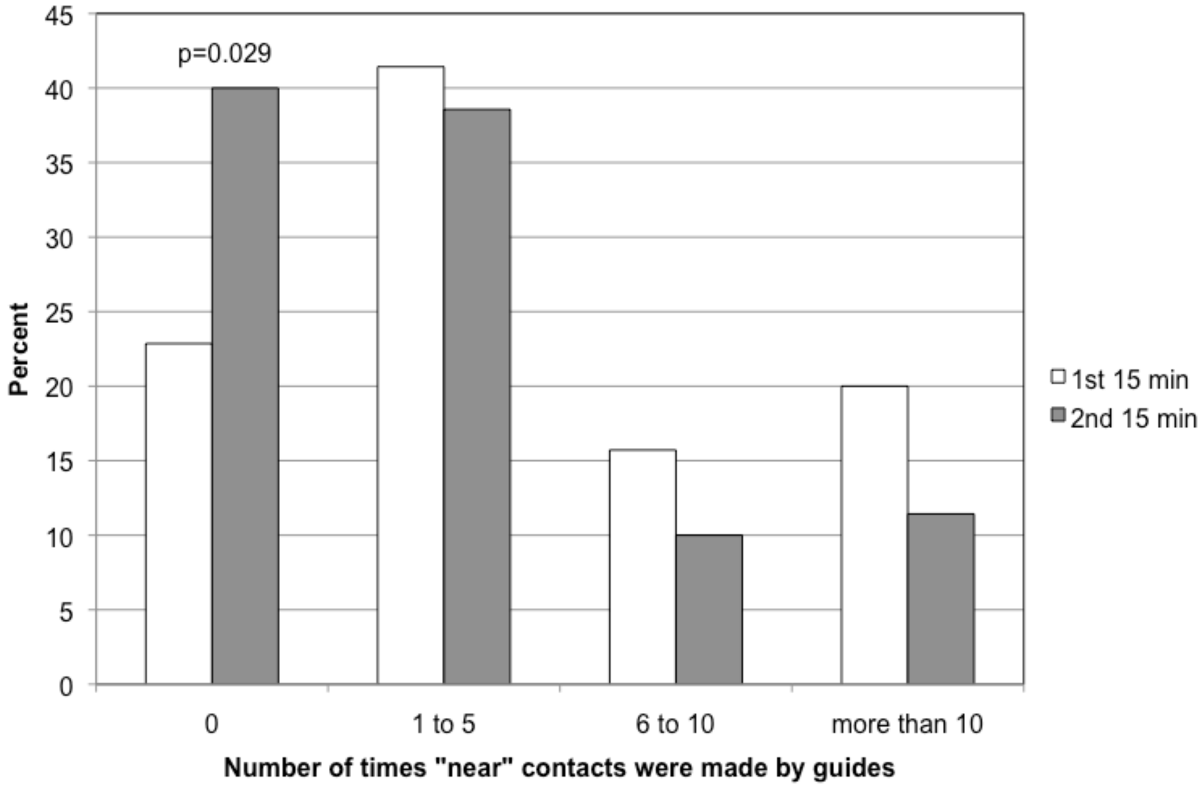


Figure 2.17. The percentage of 'near combined' interactions made by guides in the first and second 15-minute periods of the scuba dive shown per number of contacts group (n=70). Significant differences between two groups are indicated by the p-value in the figure.

The number of 'near combined' interactions in the first 15 minutes was similar for both the first or second dive of a double dive excursion (Figure 2.18; independent samples t-test, p=0.888, n=45 for first dive and 25 for second dive). Throughout the second 15 minutes of both dives the number of 'near interactions' was also similar (independent samples t-test, p=0.798, n=45 for first dive and n=25 for second dive). The difference of the first 15 minutes minus the second 15 minutes 'near combined' interactions was not significantly different between the first and second dives (independent samples t-test/paired samples t-test, p=0.763, n=45 for first dive and n=24 for second dive). There were significantly fewer contacts in second 15-minute period compared to the first 15-minute period of the first dive (paired samples t-test, p=0.014, n=45 pairs) and second dive of the day (paired samples t-test, p=0.014, n=24 pairs).

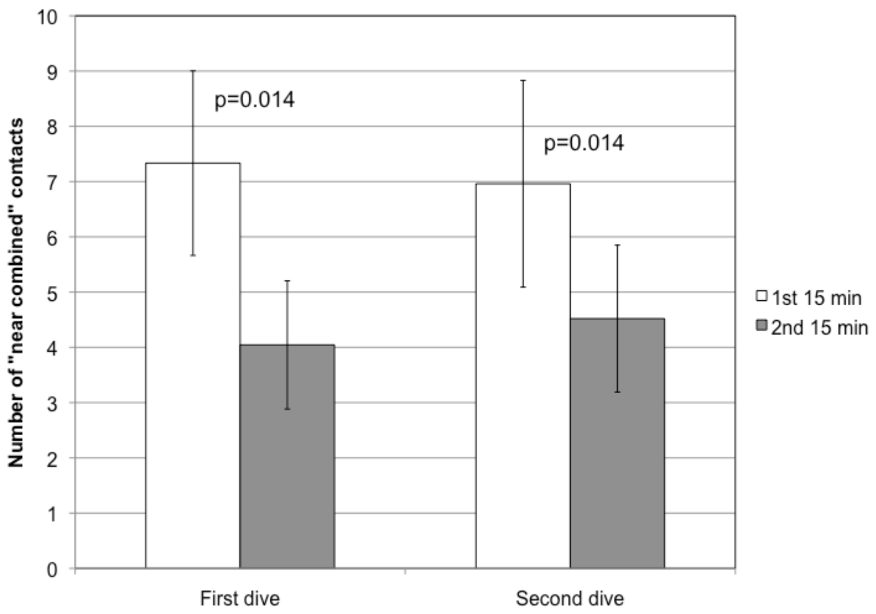


Figure 2.18. The average number of 'near combined' interactions made by guides in the first and second 15-minute periods of the scuba dive on the first or second dive of a double dive excursion (standard error of the mean indicated, n=69). Significant differences between two groups are indicated by the p-value in the figure.

All dive sites showed fewer contacts in the second 15 minutes compared to the first 15 minutes of the scuba dive (Figure 2.19), but these were not significantly different per dive site (paired samples t-test, p-values and sample sizes indicated in Table 2.14).

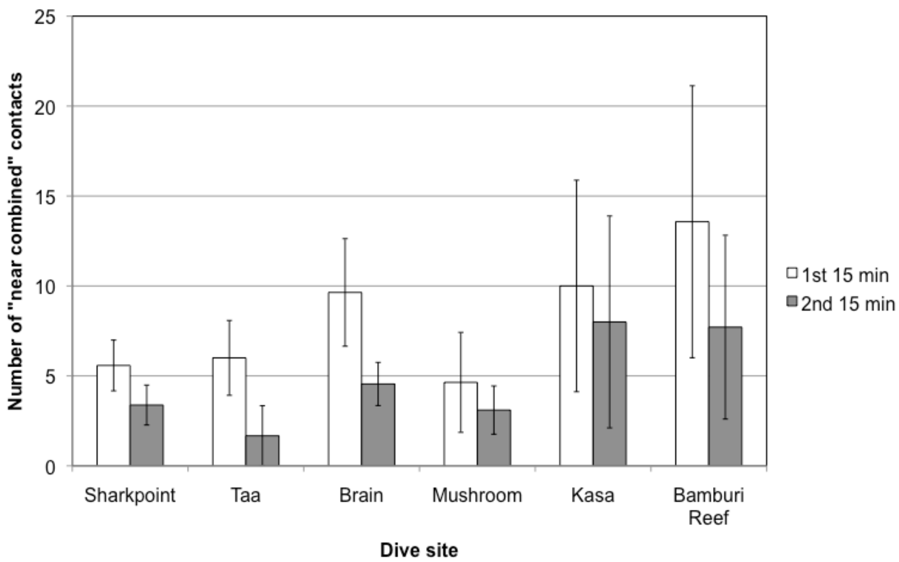


Figure 2.19. The average number of 'near combined' interactions made by guides in the first and second 15-minute periods of the scuba dive at different dive sites (standard error of the mean indicated, n=69).

Table 2.14. The sample sizes of the guides for the first and second 15-minute periods of the scuba dive per dive site and the p-values comparing the number of 'near combined' interactions at each site between the two groups (paired samples t-test).

Dive Site	Number of Pairs	p-value
Sharkpoint	33	0.115
Taa	3	0.096
Brain	11	0.102
Mushroom	10	0.330
Kasa	5	0.389
Bamburi Reef	7	0.119

Figure 2.20 indicates that in all visibility categories the second 15-minute period had fewer contacts than the first 15-minute period of the scuba dive. There existed only one significant difference between the visibility categories (6-10m visibility category) between the first and second 15-minute periods (paired samples t-test, p-values and sample sizes indicated in Table 2.15) indicating that contacts were less during the second 15-minute period.

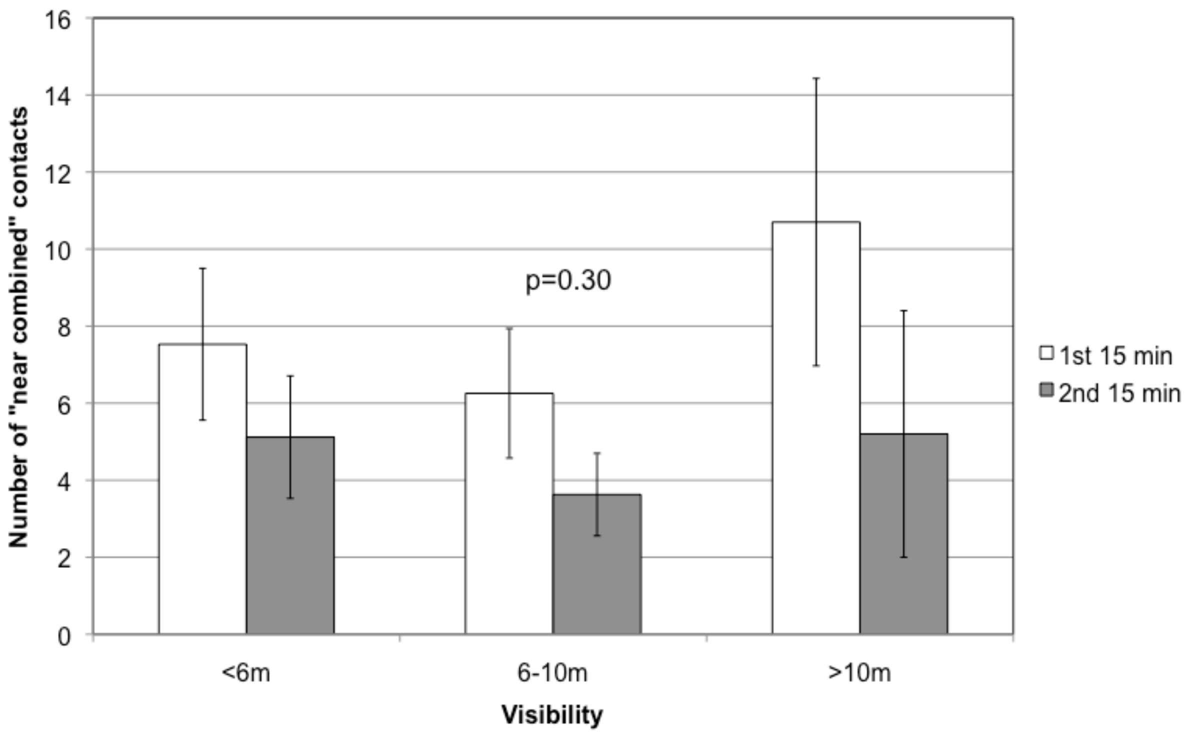


Figure 2.20. The average number of 'near combined' interactions made by guides in the first and second 15-minute periods of the scuba dive in three different categories of visibility (standard error of the mean indicated, n=69). Significant differences between two groups are indicated by the p-value in the figure.

Table 2.15. The sample sizes of the guides for the first and second 15-minute periods of the scuba dive per visibility category and the p-values comparing the number of 'near combined' interactions in each category between the two groups (paired samples t-test).

Visibility Category	Number of Pairs	p-value
0-5 meters	16	0.115
6-10 meters	43	0.030
+10 meters	10	0.074

2.4.7. First 15 minutes vs. the Second 15 minutes of the Scuba Dive: All behaviors

Table 2.16 shows that for all behaviors, apart from alive intentional contacts, that there were fewer contacts in the second 15-minute period compared to the first 15-minute period for the scuba divers. The following behaviors differed significantly: alive non-intentional, sedimentation, near and near combined.

Table 2.16. An overview of the average number of contacts of the different behavior in the first and second 15-minute period for the scuba divers (paired samples t-test).

Behavior	Average contacts First 15 minutes	Average contacts Second 15 minutes	p-value	Sample size
Alive Intentional (AI)	0.20	0.28	0.539	185
Alive Non-intentional (AN)	3.30	1.32	0.000	185
Dead Intentional (DI)	0.52	0.42	0.237	185
Dead Non-intentional (DN)	0.51	0.28	0.056	185
Sedimentation	1.90	0.36	0.001	184
Near	3.80	1.88	0.000	185
Near Combined (AI, AN, DI, DN, Near)	8.48	4.17	0.000	185

The guides displayed fewer contacts across all the different behaviors in the second 15-minute period and they all differed significantly from the first 15-minute period of the scuba dive apart from dead non-intentional and near (Table 2.17).

Table 2.17. An overview of the average number of contacts of the different behavior in the first and second 15-minute periods for the guides (paired samples t-test).

Behavior	Average contacts First 15 minutes	Average contacts Second 15 minutes	p-value	Sample size
Alive Intentional (AI)	0.26	0.06	0.047	69
Alive Non-intentional (AN)	1.84	0.81	0.001	69
Dead Intentional (DI)	0.81	0.28	0.003	69
Dead Non-intentional (DN)	0.46	0.17	0.077	69
Sedimentation	1.29	0.23	0.021	69
Near	3.99	2.94	0.101	69
Near Combined (AI, AN, DI, DN, Near)	7.3	4.21	0.001	69

2.5. Discussion: Scuba Divers

Previous studies in different geographic areas have found that scuba divers make numerous contacts with the reef substrate, mostly as a result of their fins, but also through the use of their hands (Rouphael and Inglis, 1997, Barker and Roberts, 2004, Luna et al., 2009, Medio et al., 1997). Barker (2004) reported that 81% of these contacts resulted in minor damage to the reef, while the study also found that 4% resulted in major damage. This same study showed that even though shore dives resulted in more contacts with the reef substrate compared to boat dives, boat dives resulted in higher levels of major damage. Scuba divers in the Mombasa Marine Park and Reserve are expected to be similar recreational scuba divers to divers studied in other studies and as such the contacts they make with the reef can also result in damaging contacts. Results have shown that the behavior of the diving guides and their clients, the recreational scuba divers, was shown to consist of frequent interactions with the reef substrate. Manning (2003) describes five types of problem behaviors (derived from a terrestrial study): deliberately illegal, careless, unskilled, uninformed and unavoidable. The contacts made by the dive guides and the scuba divers consisted mostly of non-intentional contacts and near contacts with the reef, and as such they can be classified as careless, unskilled or uninformed. A possible solution to unskilled or uninformed behaviors, and to a lesser extent careless behavior, is visitor education, as these problems relate to visitor knowledge and skill level (Hendee and Dawson, 2002, Manning, 2003, Marion and Reid, 2007). This argument is strengthened by results from a study of scuba divers in St. Lucia which found that most diver contacts were unintentional, and dive leader intervention reduced these contacts (Barker and Roberts, 2004). Furthermore, reef interactions of the dive guides and their clients did not differ, indicating that any future management options in the Mombasa Marine Park and Reserve aimed at avoiding contact behavior with the reef should not just be directed at recreational scuba divers, but also at the dive guides.

Various factors (personal, environmental and situational) influenced the interactions the divers had with the reef substrate. The most influential personal factor influencing diver behavior was the certification level of the scuba diver. More qualified divers appeared to make fewer contacts with the reef. This trend continued until they achieved the rating of Divemaster. Those divers that continued their education beyond the rank of Divemaster, to the Instructor level, began increasing the number of times they contacted the reef while diving recreationally (not supervising divers or teaching students). One reason to explain this could be that instructors might believe that they have the right to behave as they desire since they have achieved a milestone rating, however, more research is needed to verify this. The Divemaster rating of diving education is the most demanding course up to that point in a diver's diving career. The PADI Instructor Manual (2012) defines a Divemaster as someone who has: exemplary diving skills, professionalism, role-model characteristics, knowledge, rescue skills, supervision skills and environmental awareness. Divers who have achieved this rating have a greater sense of responsibility towards other scuba divers and the environment, and therefore have fewer contacts with reef substrate. Dearden (2007) found that scuba divers who witnessed reef damage by other members in their dive group were significantly more likely to believe that diving had a negative impact on the reef. Divemasters relate to this as they are taught to observe their surrounding divers and environment, and this skill can contribute to the attitude Divemasters possess, which prevents them from contacting or coming near the reef. Luna (2009) expressed a similar recommendation after research on scuba divers in the Mediterranean. The data further amplified this argument since all other certifications differed significantly when compared to the Divemaster certification. These differences indicate that divers who have achieved the rating of Divemaster can be considered role-model divers during scuba diving activities. This knowledge can be useful when creating interventions aimed at reducing potentially damaging behavior of scuba divers.

Another personal factor that exerted some influence on diver behavior was the number of dives an individual had completed prior to the monitoring dive. This factor is a gauge of diving experience. Results indicate a weak correlation between the number of dives a diver has made and the number of interactions with the reef substrate. A significant influence was found in the linear regression model that was applied. As one builds experience through diving, one becomes more proficient at performing certain dive skills such as buoyancy control and fin control. Having control of these skills could make it easier to refrain from interacting with the reef substrate. This measure of experience was also used by Luna et al. (2009) in the Mediterranean, and Harriot et al. (1997) in Australia, both with similar results. Thus, scuba divers that have conducted numerous dives are less likely to create as many potentially damaging behaviors as those divers with significantly fewer dives. In the recreational scuba diving industry this could be a difficult variable to manage since the scuba diving industry caters to all divers, regardless of certification and/or experience (this does not include specialist dives that require certifications for deeper depths or strenuous conditions, rather it assumes average dives with average conditions that are available to the average diver). Furthermore, no correlation is assumed to exist with the number of dives a dive guide has made and the resultant number of contacts that dive guide made with the reef (in this current study), as opposed to the recreational scuba diver. This assumption is based on the fact that the number of contacts made by the scuba divers and the guides did not differ. The number of dives these guides had made was not included in the analysis of the guide data but a safe assumption is that these guides have made many hundreds (if not low thousands of dives: personal observation by the researcher). More research would be needed to verify this assumption.

Dive site conditions and local weather conditions are environmental factors that did not have any influence on the number of contacts made by the scuba divers and the guides. Although different times of the year have different water/weather conditions in the Mombasa region, the monitoring of the scuba divers was conducted throughout entire year further strengthening that these conditions did not influence scuba diver behavior.

Most situational factors did not exert any influence on the diving behavior of the scuba divers. The situational factors examined included: different dive sites, number of divers in the group, first vs. second dive of the double dive excursion and the first 15 minutes vs. the second 15 minutes of the dive. This study design used multiple dive sites, each with a similar topography, and no influence was found as a result of the dive site on the number of contacts made by the users on the reef. Rouphael et al. (1997) studied the impacts of scuba diving on different topographies and found that dive site topography was not an important influence in the type and amount of damage done. No obvious pattern was evident when examining how the number of people in the dive group influenced the number of contacts with the reef substrate, apart from more contacts appeared evident in small groups (≤ 3). When fewer people surround a scuba diver (either recreational scuba diver or guide), he/she may feel less ‘watched’ by others and therefore become more careless, however, more research is needed to validate this. There were also no differences between divers that were monitored during their first dive or second dive of the double dive excursion, indicating that the diving behavior in both dives is similar for the scuba divers and guides.

The results indicate that environmental and situational factors did not exert any influence on the contact behavior of the scuba divers. Only the personal factor of experience (certification and number of dives) was found to influence the contact behavior of the scuba divers. This infers that the contact behavior of the scuba divers is largely a volitional behavior, or derived from choice. Management strategies aimed at reducing damaging impacts by scuba divers must take this into consideration when designing interventions to promote pro-environmental behavior.

Scuba divers and guides appear to require an acclimatization period during which they can establish a degree of comfort with their surrounding environment. This is regardless of their personal dive history (certification level and/or the number of scuba dives they have made). When the diving behavior is analyzed in two 15-minute blocks (the first 15 minutes and the second 15 minutes) it becomes evident that there are fewer behavioral contacts across all the different behaviors measured, and across all the variables explored, during the second period. Barker and Roberts (2004), Camp and Fraser (2012), and, DiFranco et al (2009) found similar results in their studies and stated that divers make more contacts in the first 10 minutes, or initial part of a scuba dive as divers adjust their equipment and become familiar with the underwater environment. This finding is valid for recreational scuba divers and guides alike. Not all these differences differ significantly yet the trend is similar. The only situational factor that thus has the ability to influence behavior of the scuba divers is the first 15 minutes of the dive vs. the second 15 minutes of the scuba dive. For management to be most effective in reducing the negative impacts of diving behavior, the intervention must be directed at the first 15 minutes of the scuba dive.

All the guides that were monitored had achieved the minimum rating of PADI (Professional Association of Diving Instructors) Divemaster. Furthermore, the dive center that sponsored the diving research ensured that any dive guide must be able to demonstrate expert knowledge of the dive sites and possess the skills (navigation, buoyancy, marine life, emergency procedures) necessary to effectively and safely lead clients on a scuba dive. Assuming that these guides should be able to navigate along the reef, and effectively maintain their buoyancy throughout the scuba dive, any observed contacts could be the result of attitudes they may have towards not contacting the reef. Management must address these attitudes to reduce impacts made by the guides. The lack of a relationship between the number of dives these guides have made and the number of contacts they made, as discussed previously, further strengthens this argument.

PART B: SNORKELER BEHAVIOR

2.6. Methods: Snorkelers

2.6.1. Snorkel Behavior

Snorkeler behavior was observed during snorkel excursions by the researcher (in snorkel gear) following the snorkelers in the water at a distance of 2-3m for a seven-minute period randomly throughout their total snorkel time. The snorkelers were not informed that they would be monitored during their in-water snorkel activity. After observing the snorkelers, their behaviors were transformed to the equivalent of a 30-minute period, as not all snorkelers could be monitored for the full seven minutes. The behavior of each snorkeler was calculated per minute and then multiplied by 30 to arrive at a projected number of behaviors per 30-minute period. The 30-minute period was chosen as it best reflected the average snorkel time of the snorkelers visiting the Mombasa Marine Park and Reserve (personal observation derived from accompanying excursions). The extrapolated 30-minute period was not to be considered indicative of actual contacts within a 30-minute period, rather, it was used to facilitate comparison.

Originally 12 separate actions were measured (Table 2.18: first column) and these were subsequently reduced to five behavior categories used for analysis (Table 2.18: right side). Definitions of the actions are shown in Table 2.19. The non-intentional contacts were grouped together under 'accidental' behaviors, as the snorkeler did not choose to make these contacts. The actions of standing (comfortably or uncomfortably) on living substrate were grouped together with the alive intentional and actions as standing reflects a conscious decision to make contact. The same grouping was used for the contacts on dead substrate. The actions of standing on seagrass comfortably and uncomfortably were grouped together as a conscious decision was made to stand up. The snorkel behavior of the guides was also monitored, in the same manner as described above, to assist with understanding the behavior of snorkelers. Inferred decisions were made to label behaviors as either intentional or non-intentional based on how the snorkeler/guide made the behavior and the surrounding context. All behavior actions were recorded on an underwater slate by the researcher (see monitoring slate template in *Appendix 4*). Only snorkelers frequenting the location 'Bamburi Coral Garden' were used in this study.

Table 2.18. Behavior matrix showing the 12 measured actions (1st column) and the five resultant behavior categories used for analysis (right side of table: alive intentional, dead intentional, standing on seagrass, accidental and wildlife handling).

Contact	Alive Intentional	Dead Intentional	Standing on Seagrass	Accidental	Wildlife Handling
Alive Intentional Contacts	✔				
Alive Non-intentional Contacts				✔	
Dead Intentional Contacts		✔			
Dead Non-intentional Contacts				✔	
Wildlife Handling					✔
Sedimentation					
Standing on Living Substrate Uncomfortably	✔				
Standing on Non-living Substrate Uncomfortably		✔			
Standing on Living Substrate Comfortably	✔				
Standing on Non-living Substrate Comfortably		✔			
Standing on Seagrass Comfortably			✔		
Standing on Seagrass Uncomfortably			✔		

Table 2.19. Definitions of actions for monitoring of snorkelers. All definitions below are scored per single occurrence.

Item	Definition
Alive Intentional (AI)	Anytime a snorkeler intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Alive Non-intentional (AN)	Anytime any part of a snorkeler's body or an extension thereof (fins, camera, etc.) comes into contact with living substrate that the individual did not plan or was unaware of.
Dead Intentional (DI)	Anytime a snorkeler intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with non-living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Dead Non-intentional (DN)	Anytime any part of a snorkeler's body or an extension thereof (fins, camera, etc.) comes into contact with non-living substrate that the individual did not plan or was unaware of.
Wildlife Handling	Anytime a snorkeler handles wildlife. This could be self-initiated or it could be wildlife that has been offered to them by someone else. Examples include handling a starfish, handling a shell with a living organism in it, touching fish, feeding fish.
Sedimentation	Anytime a snorkeler makes a movement with a limb (arm or leg) that results in sediment becoming suspended in the water (creating a dust cloud).
Uncomfortable Standing on Alive Substrate (St Alive unCOM)	The intentional standing on living substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.
Uncomfortable Standing on Dead Substrate (St Dead unCOM)	The intentional standing on dead substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.
Comfortable Standing on Alive Substrate (St Alive COM)	The intentional standing on living substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Comfortable Standing on Dead substrate (St Dead COM)	The intentional standing on dead substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Standing on Seagrass Comfortable (St SG COM)	The intentional standing on seagrass substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Standing on Seagrass Uncomfortable (St SG unCOM)	The intentional standing on seagrass substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.

Alive Substrate: Any living substrate excluding algal species and plant species. Examples include: sponges, corals, fish.

Dead Substrate: Any non-living substrate including algal species and plant species. Examples include: living rock, macro algae.

Data concerning environmental variables that could have influenced snorkeler behavior were also collected during the snorkel excursion. Data were collected on: cloud coverage; current strength; tidal height; and, underwater horizontal visibility. Cloud coverage was determined by the researcher examining the sky directly prior to an excursion and determining how many '$^1/_8$'s' of the sky were covered by clouds. The underwater current present throughout the in-water snorkel activity was assigned to a category of weak, average or strong by the researcher. Tidal height was calculated by using the number of minutes the snorkelers started their snorkeling activity before, or after, the low tide, and relating that to the height of the tide on that day. The underwater horizontal visibility was estimated by the researcher at the start of every monitoring dive.

Data regarding personal variables were also recorded by the researcher. Two questions administered from a questionnaire provided data on how long the snorkelers had been snorkeling for, and how important they regarded snorkeling as an activity they partake in. Both questions were multiple-choice questions.

2.6.2. Sample Size

The sample size of the monitored snorkelers used in describing the snorkel behavior of visiting snorkelers consisted of 167 individual snorkelers and 38 individual guides. The data for 94 of the snorkelers also included measures of how long the respondents had been snorkeling and how important that activity was to them compared to other activities.

2.6.3. Statistical Analysis

To understand whether differences existed between the snorkelers and the guides, independent samples t-tests were performed to compare the behavior of the two different groups. The independent samples t-test was used as it is a robust test regarding the assumption of normality, especially with sample sizes larger than 50. Linear regressions were used to determine if various environmental factors (current, cloud coverage, tidal height and underwater visibility) influenced the different behaviors.

2.7. Results: Snorkelers

Figures 2.21 and 2.22 show the frequency of projected different contacts in a 30-minute period for snorkelers and guides respectively. Nearly 30% of all snorkelers intentionally contacted living substrate (alive intentional), and most of these contacts were repeated more than 10 times during a 30-minute snorkel (range 4-137 times per 30 minutes, n=167). The accidental contacts were similar to the intentional contacts on living substrate (range 4-124, n=167). Most of the snorkelers did not have any wildlife handling behavior and the few that did were not frequent (range 4-17, n=167). Nearly three quarters of all snorkelers refrained from contacting dead substrate (dead intentional: range 3-30, n=167) and a similar result was evident for the contacts on seagrass substrate (seagrass: range 3-26, n=167).

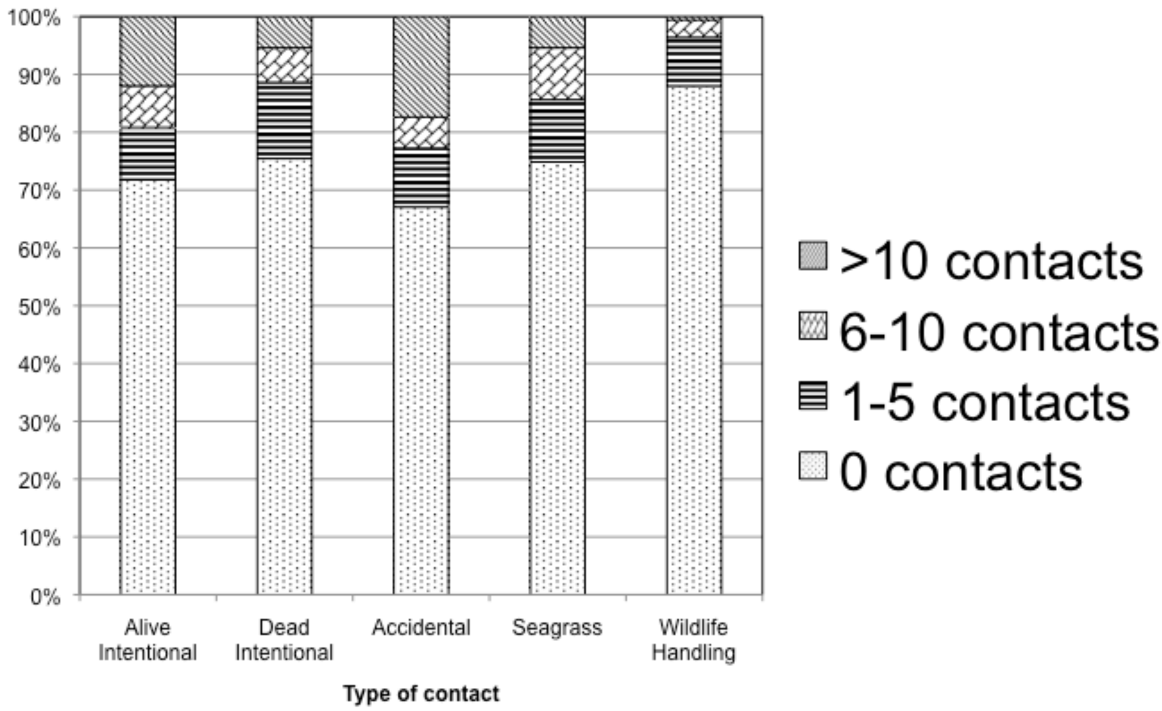


Figure 2.21. The behavior of the snorkelers. The bars indicate the percentage of snorkelers that performed each type of contact on the reef substrate (n=167).

The snorkel behavior of the guides consisted of more contacts than that of their clientele (snorkelers). Approximately 40% of all guides contacted living substrate (alive intentional: range 4-43 times per 30 minutes, n=38), and the same trend existed for the contacts on non-living substrate (dead intentional range 4-56, n=38). Accidental contacts with the substrate were made approximately 25% of the time (range 4-30, n=38). The guides contacted seagrass substrate and displayed wildlife handling behavior approximately 35% of the time (range 4-30, and 4-21 respectively, n=38).

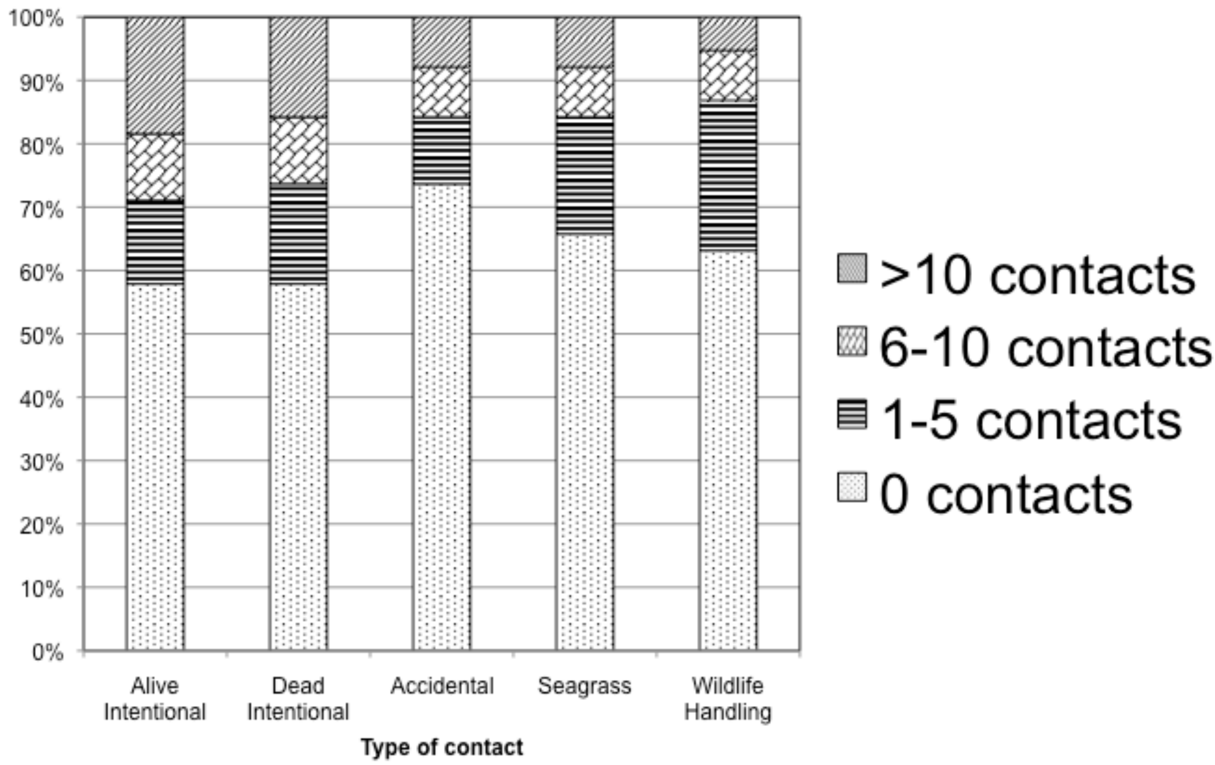


Figure 2.22. The behavior of the guides. The bars indicate the number of times the guides performed each type of contact on the reef substrate (n=38).

Table 2.20 indicates the average contacts of the snorkelers and the guides per behavior and the p-values comparing the snorkelers to the guides for each behavior. Significant differences between snorkelers and guides were evident for accidental contacts with the reef substrate (the snorkelers had significantly more of these behaviors) and wildlife handling (the guides had significantly more of these behaviors).

Table 2.20. The average number of behaviors performed by the snorkelers and guides, and the respective p-values comparing each of the behaviors between the snorkelers and guides (independent samples t-test, n=167 for snorkelers and n=38 for guides).

Behaviour	Snorkelers n=167	Guides n=38	p-value
Alive Intentional	4.6	6.2	0.51
Dead Intentional	2.3	6.2	0.06
Seagrass	2.1	3.2	0.18
Accidental	5.7	2.7	0.04
Wildlife Handling	0.7	2.6	0.02

Comparing the different behavior of the snorkelers to each other revealed that snorkelers contacted living substrate significantly more than they contacted non-living substrate and seagrass substrate. Furthermore, accidental contacts were significantly greater than contacts on non-living substrate (Table 2.21; independent samples t-test, n=167). The same comparisons with the behavior of the guides found no significant differences (independent samples t-test, p>0.05, n=38).

Table 2.21. The different behavior of the snorkelers compared to each other. P-values indicate a significant difference (the asterisk shows which is greater; independent samples t-test, n=167; not significant refers to p>0.05, x=no comparison, ns=non-significant).

Behavior	*Alive Intentional	Dead Intentional
Alive Intentional	x	x
Dead Intentional	p=0.05	x
*Accidental	ns	p=0.003
Seagrass	p=0.03	ns

When the number of contacts made by snorkelers was compared to their experience level, it was evident a u-shaped distribution existed: snorkelers with little experience and high experience had more contacts, whereas snorkelers with intermediate experience had few contacts (Figure 2.23, n=89). The low point of the number of contacts differed for different behaviors: e.g. 4-6 years for seagrass contacts and wildlife handling, 7-10 years for alive intentional and dead intentional contacts, and 2-3 years for accidental contacts.

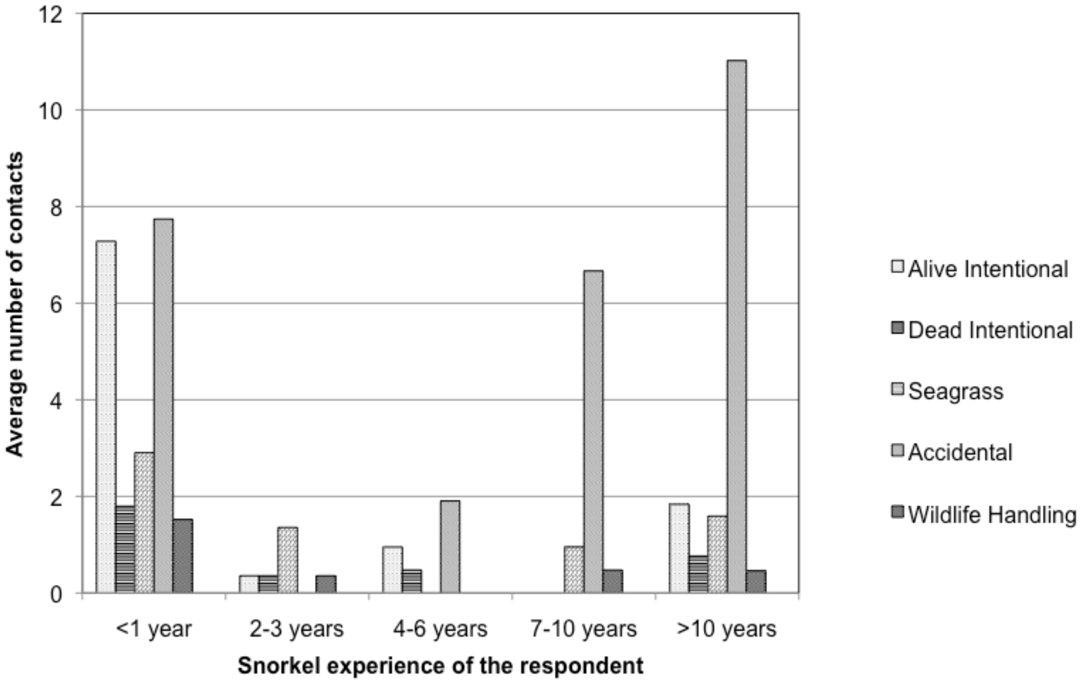


Figure 2.23. Number of contacts per behavior group compared to the number of years the respondents have been snorkeling (n=89: <1 year n=31, 2-3 years n=12, 4-6 years n=9, 7-10 years n=9 and >10 years n=28).

The importance the respondents attached to snorkeling was compared to the number of contacts they made (Figure 2.24). Those respondents who placed lower importance to snorkeling had more contacts than individuals who placed higher importance on snorkeling.

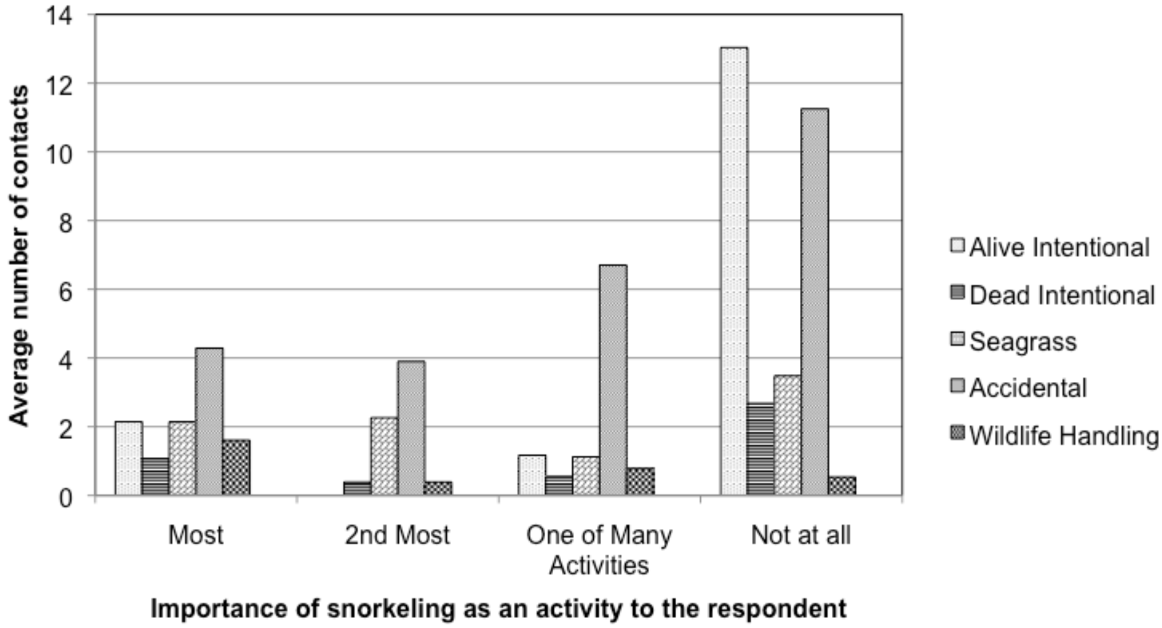


Figure 2.24. Number of contacts per behavior group compared to the importance the respondents have attached to snorkeling as an activity compared to other activities they engage in (n=89: most n=8, 2nd most n=11, one of many n=55, not at all n=16).

Linear regressions were conducted for each behavior performed by snorkelers and guides to determine if the following environmental factors had some influence on the number of contacts they made: cloud cover, current strength, underwater horizontal visibility and relative tidal height at the time of snorkeling. The complete linear regression tables are found in *Appendix 5* and only a synopsis of the results is presented here. Current was the only variable that exerted some degree of influence on some of the behaviors by snorkelers and guides, resulting in dead intentional behaviors of snorkelers increasing with current (p=0.041, beta=0.158, n=167). Dead intentional and alive intentional behaviors conducted by guides increased as a result of the current (p=0.017, beta=0.397, and p=0.002, beta=0.501 respectively; n=38).

2.8. Discussion: Snorkelers

The behavior of snorkelers and guides reveal that numerous contacts were made with the reef substrate while snorkeling in the Mombasa Marine Park and Reserve. It is not important if these contacts were intentional or accidental, as contacts with living substrate have been shown to cause negative impacts in numerous other studies (Plathong et al., 2000, Barker and Roberts, 2004, Luna et al., 2009). There is a difference between the intentional touches on living and dead substrate of the snorkelers as more touches were evident on living substrate. There were also very few contacts on seagrass substrates. Reasons to explain why contacts on dead substrate and seagrass are underutilized could include the lack of knowledge in knowing what is alive on a reef, or a lack of knowledge in knowing that contacting seagrass is not damaging to the coral reef substrate. Another alternative is that the guides are not making this area available for their clients (not leading them to rest areas on seagrass substrates). Snorkelers could also be unaware of one’s actions (such as not realizing that contacts with the reef substrate can inflict damage, or not realizing that they are contacting the reef substrate). Another possibility is that people want to touch living substrate to satisfy a sense of curiosity or exploration (using the sense of touch to achieve this). However, more research regarding the attitudes these snorkelers have regarding damaging the reef, and also about the prior knowledge the snorkelers possess about the marine environment, is needed to verify this conclusion.

Snorkel experience is a personal factor that had some influence on snorkeler behavior. Most snorkelers that frequented the Mombasa Marine Park and Reserve were novices (*Appendix 3*), and novices are: “frequently ill at ease floating horizontally and, when near features of interest, may tread water to talk, rest, or adjust poorly fitting equipment (Robinson 1976, Allison 1996)” (Plathong, Ingliss et al. 2000, p. 1829). However, it is not just novices that have numerous contacts, rather, it is both the novices and experienced snorkelers. Snorkelers with an intermediate amount of experience appear to have the least amount of contacts across all behavior types. The experienced snorkelers (those who have been snorkeling for many years) may have started snorkeling numerous years ago yet may not have engaged in much snorkeling since, equating them with novices. The resultant conclusion is that the influence of experience (personal factor) on snorkeler behavior is complex. The assumption that increased experience will automatically lead to less potentially damaging behavior is not one to be taken for granted. This factor is also different for snorkelers and scuba divers, as scuba divers did appear to make fewer potentially damaging contacts as experience levels increased. The main difference between scuba divers and snorkelers that could explain the contact behavior disparity mentioned above are the prerequisites required to partake in each activity. Scuba diving certifications require minimum training in diving theory to include knowledge about the marine environment, basic watermanship skills and competency in diving skills whereas to engage in snorkeling activities no prerequisites exist (i.e. anybody who wants to can snorkel).

When snorkelers contact dead substrate or seagrass areas no damage is done to the surrounding living substrate. The seagrass itself may be harmed but seagrass grows back quickly, while corals grow back at a very slow rate. Snorkelers could use these areas (dead substrate and seagrass areas) as rest areas or comfort breaks during which they can adjust their equipment or discuss what they have seen with fellow snorkelers. This ‘rest stop’ would be the opportune moment for guides to step in and assist their clients. Guides could use these opportunities to illustrate what they have just seen, or offer guidance and/or assistance to their snorkeling clients. Guides often tend to be respected by their snorkeling clients as they are deemed an expert in their field (snorkeling). Furthermore, guides tend to act as role-models of various behaviors that are acceptable and permissible within a protected area (Skanavis and Giannoulis, 2009, Littlefair, 2003), and as such have the ability to influence the behavior of their snorkeling clients by persuading them to utilize these dead substrate/seagrass areas. In order for the guide’s influence to be effective, the guides could benefit from a training program allowing them to incorporate the above mentioned into their snorkel excursions.

The snorkel behavior of the guides was similar to that of their snorkeling clients, however, the intentional behavior of the guides was influenced more by the current. This result could indicate that guides had less control than their snorkeling clients. Alternatively it could be argued that guides intentionally contacted the reef substrate more often to counter the effects of the current, or to assist their snorkeling clients, but more research is needed to validate this. Since there existed no differences between the intentional contacts made by the snorkelers and guides, it could be that the snorkelers mimicked the behavior of their guides regarding the contact behavior with the reef, their role-models (Littlefair, 2003, Skanavis and Giannoulis, 2009). There existed no difference in different types of contacts made by guides (e.g., intentional contacts were similar to the non-intentional contacts) indicating that the guides had no preference in how they contacted the reef substrate. Both the guides and the snorkelers made little use of the seagrass substrate and no difference existed between the two groups. This finding could indicate that the guides were ignorant of the fact that contacting seagrass areas can do no harm to the surrounding environment, alternatively, perhaps they were not comfortable touching the seagrass. The exact reason would require further research. However, what is evident is that the guides underutilize these areas as rest stops to offer guidance and assistance to their snorkeling clients.

The guides initiated wildlife handling behavior on a regular basis (den Haring pers obs 2010), usually in the form of feeding the fish, yet their snorkeling clients were not always willing to mimic this behavior. The Kenya Wildlife Service, the park’s management authority, has displayed brochures and posters at the ticket offices that state that feeding wildlife is not permitted within the park. Snorkelers could have seen these messages and decided not to mimic the behavior of their guide. Alternatively, when the guides feed the fish, the surrounding water environment around the guide transforms into a frenzy of herbivorous fish and this can create an intimidating environment leading to fear and anxiety, as described in a study by Orams (2002), and ultimately resulting in the snorkeler refraining from replicating the feeding behavior of the guide.

The behavior of the snorkelers was not influenced by environmental conditions such as cloud coverage, underwater horizontal visibility nor relative tidal height. Current strength did have an influence on snorkel behavior (guides), indicating that snorkel behavior is under almost complete volitional control, and therefore that it is receptive to being influenced. Further exploration of the data will indicate where and how any influence is expected to have the greatest effect in reducing contacts with the substrate.

To summarize, both guides and their snorkeling clients appear to be making numerous contacts with the reef substrate. These contacts appear to be manageable and intervention is needed to reduce these contacts. This intervention could differentiate between living and dead substrate explaining what can, and cannot be touched. Seagrass areas abound within the snorkeling areas of the Mombasa Marine Park and Reserve and they offer, sometimes much needed, opportune rest areas for snorkelers. These areas are underutilized and could be incorporated into the snorkeling excursion.

2.9. Conclusion: Scuba Divers and Snorkelers

Due to impacts created by scuba divers and snorkelers, active management of the marine resources within the Mombasa Marine Park and Reserve is necessary. Several different management options exist that could ensure the marine resources are afforded protection. Orams (1996a) mentions four broad types of resource management options: physical, regulatory, economic and educational. Expanding on some of these options, Harriot and Banks (1997) suggest options such as mandatory refreshers for those divers (snorkelers) who have had a period of diving (snorkeling) inactivity, placing an annual maximum number of divers (snorkelers) on a dive site, creating a no-touch policy within the park boundaries, or establish realistic entry fees into the park that reflect the cost of damaging coral reefs. As effective as these options could be, the major obstacles are the willingness of operators to comply (refreshers, not visiting heavily used sites), the required enforcement (no touch policy, closing heavily used sites) or the financial levy placed upon potential damage to the resources (divers and snorkelers may not be willing to pay a realistic entry fee that reflects coral damage).

Another option that could be applied to minimize negative impacts on marine resources is the implementation of interpretation. Orams (1996a) states that interpretation can influence visitor behavior to reduce inappropriate behaviors, an idea shared by others as well (Moscardo, 1998, Madin and Fenton, 2004, Pastorelli, 1998, Littlefair, 2003). Given that the behaviors described in this study are largely volitional, or under complete control of the individual, interpretive efforts could meet with success in minimizing impacts. These damaging behaviors are therefore susceptible to interpretive efforts aimed at influencing scuba diver and snorkeler behavior (Ham et al., 2009). Medio (1997) examined the effects of briefings in minimizing impacts by divers in the Red Sea and found that briefings and/or interpretive material can reduce the incidence of damage to marine resources. Madin and Fenton (2004) expand on this and state that interpretive programs should increase diver's knowledge of reef environments, and establish a greater appreciation of the marine environment by targeting the attitudes and values of divers. Interpretation could therefore influence diving behavior to make it more pro-environmental. Marion and Reid (2007) lend further support to the use of interpretation to manage visitor impacts to the resources within a (marine) protected area with their study of educational efforts in protected areas throughout the United States. Guides are expected to be more skillful when diving or snorkeling yet they exercise similar amounts of interaction with the reef as their clients. Their attitude towards not interacting with the reef could explain this behavior. Interpretive efforts could also influence these attitudes (Ham, 2007, Ham and Krumpe, 1996).

To summarize, scuba divers and snorkelers have frequent interactions with the reef substrate while they are engaged in recreational resource use. Personal variables, such as experience, and environmental variables, such as current, do not exert much influence on this behavior indicating that this behavior is largely volitional (during “normal” diving/snorkeling activities and not necessarily during reactionary instances such as panic, water in snorkel). Furthermore, the behavior of the resource users and the guides appears to be similar. Minimizing impacts to the reef by scuba divers (recreational scuba divers and/or guides) and snorkelers (recreational snorkelers and/or guides) can be achieved through interpretive efforts. For scuba divers the interpretation should aim to target the first 15 minutes of the scuba dive (the acclimatization period), and incorporate the importance of experience. Dive guides should pay close attention to their diving clients throughout this acclimatization period. Management could also consider using dive sites that have starting point areas of lower diversity and/or health for the first segment of the dive that would then lead to reef areas with higher species diversity and/or health (more fragile portion of the reef) for the last segments of the dive. The number of scuba dives one has made is the most important factor to consider and to a certain degree the achievement of the Divesmaster rating. For the snorkelers the interpretation should aim to explain the differences between living and dead coral reef substrate, and promote the use of the sand and seagrass areas throughout snorkel excursions. The next chapter will begin the process of developing interpretive communication by discovering the salient beliefs that underlie the reef-contacting behavior of scuba divers and snorkelers.

Chapter 3: Setting the Scene for Interpretation: the Salient Beliefs of Scuba Divers and Snorkelers in the Mombasa Marine Park and Reserve, Kenya, When it Comes to Not Contacting the Coral Reef Substrate

3.1. Introduction

The previous chapter indicated that scuba divers and snorkelers in the Mombasa Marine Park and Reserve make frequent contacts with the reef. Most of these contacts were a result of touching and standing, causing impacts on the marine resources. One method of protecting these resources is to manage the impacts of visitors by influencing their behavior so that it is less damaging to the environment. Contacts made by the visitors were largely volitional, or under complete control of the individual, indicating that scuba diver and snorkeler behavior would be receptive to interpretation (Ham et al., 2009). Interpretation could therefore be used to influence user behavior making it more pro-environmental as discussed in *section 1.2.3 of the Literature Review* and Figure 1.8. However, to create effective interpretation one must understand where interpretive efforts will be most beneficial in minimizing negative impacts (Ham et al., 2009). Identifying the salient beliefs scuba divers and snorkelers have towards not contacting the reef substrate will provide the desired direction and content of interpretive efforts. The guides of scuba diving and snorkeling excursions were also found to have frequent contacts with the reef substrate (*Chapter 2*), and thereby create impacts on the marine resource. As such the guides may also benefit from interpretive efforts.

Orams (1996a) suggests that education can be used to increase the awareness of scuba divers and snorkelers about the impacts they may have on reefs. This increased awareness could then exert an influence on the behavior of those resource users. Education in this sense includes any type of communications aimed at the scuba diver or snorkeler with the goal of influencing their actions, such as persuasive communications (Mayes and Richins, 2008, Skanavis and Giannoulis, 2009, Ballantyne and Packer, 2005). Effective persuasive communications rely on an understanding of behavior theory so that the salient beliefs underlying negative impact behavior can be identified. Salient beliefs in this context are those beliefs that have the greatest influence in deciding if the behavior is to occur, or not occur.

Research examining scuba diver and snorkeler behavior, and how this behavior can be influenced, is lacking in the Mombasa Marine Park, leading to obstacles for efficient management of the resources within the park. Understanding scuba diver and/or snorkeler behavior and identifying potentially damaging behavior is essential if behavior change is to occur. The discovery of salient beliefs influencing this behavior can then be targeted by persuasive communications. These communications in turn are intended to influence behavior so that it becomes more pro-environmental resulting in less resource damage. This study investigates the salient beliefs of scuba divers and snorkelers in the Mombasa Marine Park and Reserve as an initial step in designing an appropriate management regime to reduce user impacts. The next section explains how these salient beliefs can be used to bring about behavior change.

3.1.1. Theoretical Framework

Discovery of Salient Beliefs

The Theory of Planned Behavior (TPB) is a theoretical model that explains an individual's volitional behavior (see *Chapter 1, section 1.2.3.* for a more in depth discussion of TPB). The Theory of Planned Behavior argues that volitional behavior (such as purposely touching coral reef substrate during a scuba diving excursion) is a result of intention, which in turn is dictated by three components: attitude towards the outcome of a particular behavior, subjective norm regarding that behavior, and perceived behavioral control in performing that behavior (*Chapter 1* defines these components). Each of these components that dictate behavioral intention originates from underlying beliefs: attitudes are created by behavioral beliefs, norms by normative beliefs and perceived behavioral control by control beliefs.

Within each individual there exist numerous beliefs about any particular behavior but only a few dominant beliefs will be of importance when the opportunity presents itself in performing the behavior. These important beliefs are referred to as the salient beliefs towards that behavior. Salient beliefs could be behavioral, normative or control beliefs, and to influence behavior successfully, these salient beliefs must be identified and targeted by communication efforts (Ham et al., 2009). TPB thus provides a framework that reveals how behavior is linked to the underlying beliefs of attitudes, norms and perceived behavioral control. Through TPB it can then be seen that only a few of these underlying beliefs (the salient beliefs) are important in controlling behavior. By understanding these salient beliefs, and how they influence behavior, TPB can assist the design of communication efforts aimed at influencing the behavior of divers and snorkelers (Ham et al., 2009, Ajzen, 1988).

To determine an individual's behavioral beliefs, normative beliefs and control beliefs, two aspects of each belief must be measured. For behavioral beliefs one must know the strength of that belief (how likely a person believes the outcome to occur) and the evaluation of that belief (how good/bad a person believes the outcome to be; Ham, Brown et al. 2009). Normative beliefs require determination of the social referents (Ham et al., 2009), or those important others the person would believe would approve/disapprove of performing the behavior, and determination of how strongly the person believes the social referents would approve/disapprove of the behavior. The second part that must be measured is the motivation to comply, or how much a person wishes to adhere to the wishes of the social referent (Ham et al., 2009). Control beliefs require that the strength of what the person perceives to facilitate (facilitator) or hinder (inhibitor) the behavior must be measured, as well as the ease or difficulty with which the behavior can be performed (Ham et al., 2009).

Once the salient beliefs are identified, persuasive communications can be used to target those salient beliefs and create an influence on the resultant behavior. Salient beliefs have been targeted in various studies where volitional behavior was influenced into more pro-environmental behavior. Examples of interpretive efforts in Australia (Tasmania, Queensland, Western Australia and Victoria) targeting salient beliefs are illustrated in Ham et al. (2009) and Curtis (2008). One of these studies examined the behavior of staying on national park trails. The results revealed that a normative belief was the main salient belief driving people's behavior regarding the target behavior. The visitors indicated that the park rangers were the social referents who would approve of staying on the trails and there was a strong motivation to comply with the wishes of the social referent. This normative belief was then targeted through signage throughout the park. O'Brien (2000) and Powell (2008) describe studies that targeted salient beliefs of visitors to the Galapagos. These studies indicated that salient beliefs were targeted successfully resulting in increased support for conservation efforts by the visitors to the Galapagos. No studies have yet used such an approach in marine recreational resource use, or investigated the salient beliefs underlying potentially damaging behavior of these resource users.

Chapter 1 introduced, and explained, the TORE™ model of persuasive communication. The TORE™ model can be used to design interpretive communications to achieve behavior change of recreational resource users by targeting salient beliefs underlying potentially damaging behavior. This study aims to discover the salient beliefs of scuba divers and snorkelers towards not contacting the reef substrate. These salient beliefs will then be incorporated into an interpretation program aimed to change the behavior of snorkelers into more pro-environmental behavior (see *Appendix 1*). The TORE^{TM} model will then be used to design and deliver the interpretive program (*Chapter 4*).

3.1.2. Aims of this Study

This chapter applied the Theory of Planned Behavior in a recreational marine resource use setting as a framework to determine what the salient beliefs are of scuba divers and snorkelers towards not contacting the coral reef. The research questions are:

1. What are the salient beliefs towards not coming near the reef of scuba divers in the Mombasa Marine Park and Reserve? And which of these salient beliefs are usable in persuasive communications?
2. What are the salient beliefs towards not contacting the reef of snorkelers in the Mombasa Marine Park and Reserve? And which of these salient beliefs are usable in persuasive communications?

Understanding scuba diving and snorkeling behavior and the salient beliefs underlying that behavior will facilitate in designing interpretation aimed at influencing behavior of these resource users to make it less damaging to the environment and thereby assist with resource management. This research will provide the necessary groundwork for additional elements of the research (*Chapters 4 and 5*).

3.2. Methodology

3.2.1. Overview of Methods

This study was conducted in the Mombasa Marine Park and Reserve, Kenya. All snorkeling and scuba diving excursions that are included in this study were conducted in the Mombasa Marine Park. The scuba diving excursions frequented both lagoon and outer reef sites as part of their daily excursions. All data collection with the scuba diving excursions were gathered on the outer reef trips. The snorkeling excursions only frequented patch reefs within the lagoon of the park. The research consisted of two phases. The first phase involved gathering data by monitoring the scuba divers and snorkelers (*Chapter 2*) to assist in determining the salient beliefs of the scuba divers and snorkelers. Their interactions with the coral reef substrate (number and types of contacts with the reef) were recorded and they were subsequently identified as visitors who complied (‘compliers’) with the target behavior (not contacting the reef), or as visitors who did not comply (‘non-compliers’) with the target behavior. The divers and snorkelers were then interviewed to understand their beliefs about not contacting the reef when they scuba dive/snorkel.

As part of the second phase, results from the first phase surveys were used to develop a structured survey to quantify salient beliefs about not contacting the reef. More visitors were then monitored during their resource use and their interactions were recorded. The labels of ‘complier’ and ‘non-complier’ were again assigned to these visitors and the structured survey was administered to them. These methods are discussed in more detail below.

The underlying beliefs that govern behavior cannot be observed, they must be discovered using questions (Ham et al., 2009). Before asking respondents questions about their beliefs, it is necessary to observe their behavior and determine if the respondent conforms to the target behavior or not. Being able to differentiate between those scuba divers and snorkelers who conform to the target behavior from those who do not conform is of utmost importance, as it is the differences in the salient beliefs of the two groups that will dictate which salient beliefs can be addressed through interpretation. Furthermore, the target behavior must be observable.

PART A: SALIENT BELIEFS OF SCUBA DIVERS

3.3. Methods: Scuba Divers-Salient Beliefs

3.3.1. Phase One-Elicitation of Beliefs

The method used to discover the salient beliefs scuba divers hold regarding a specific behavior was based on methods developed by Ham et al. (2009) and consisted of two phases. The first step in this process involved identifying the specific behavior that needed to be influenced. The target behavior of this research project for the scuba divers was defined as ‘not getting close (~10cm) to the living reef’. This behavior was chosen as contact with the reef substrate can be a direct cause of damage to the environment (the reef). Results from pilot monitoring data further support the use of “not getting close” rather than actual contacts as discussed in *section 2.3.1*.

Scuba diver behavior was observed during scuba diving excursions to assist in determining the salient beliefs of scuba divers (identifying ‘compliers’ and ‘non-compliers’). The scuba divers monitored in this chapter were the same scuba divers from *Chapter 2*. This monitoring was conducted by following the scuba divers at a distance of 2-3m for the duration of the scuba dive (~45 minutes). To avoid any non-natural behavior of the divers, the scuba divers were not informed that they would be monitored. The observations of the scuba diving behavior were recorded in 15-minute blocks throughout the dive and started 3 minutes after the divers began their descent from the surface. This three-minute delay was necessary as not all scuba divers descended together, or quickly, or because occasionally the divers descended onto the reef top and needed 1-2 minutes to reach the slope of the reef where they would begin swimming along the reef with the current. The 3-minute waiting period was thus necessary to ensure that all scuba divers were monitored during the same portion of their scuba dives. The monitoring of the scuba divers stopped when either 45 minutes of monitoring time had been achieved (dive time of 48 minutes), or a scuba diver initiated an ascent to the surface. Efforts were made to maximize data collection of as many divers as possible. When not all scuba divers ascended together (if one diver was low on air, but the remaining divers had sufficient air to continue) the dive group was split up and the researcher stayed with the remaining scuba divers to continue monitoring the behavior of those divers. The average scuba dive in the Mombasa Marine Park and Reserve is approximately 45 minutes (this is derived from the researcher having worked in the Mombasa scuba diving industry for five years), however, as not all scuba divers were able to complete a 45-minute scuba dive (due to air consumption) only the first 30 minutes of the scuba dive were used in the analysis. The following behaviors were recorded: coming within 10 cm of the reef substrate (the researcher approximated the 10cm distance), intentionally touching either alive or dead substrate, unintentionally touching alive or dead substrate and kicking up sediment from the reef substrate. Intentional and unintentional touches were only recorded in their respective behavior categories and not duplicated in the ‘coming within 10 cm behavior’ category. Inferred decisions were made to label behaviors as either intentional or non-intentional based on how the diver made the behavior and the surrounding context. All behavior actions were recorded on an underwater slate by the researcher (see monitoring slate template in *Appendix 4*).

After completion of the scuba diving activity the divers completed a survey designed to elicit their beliefs about not getting close to the reef substrate when they scuba dive. The survey consisted of eight verbal, preset, open-ended questions (Table 3.1) about behavioral beliefs, normative beliefs and control beliefs (Ham et al., 2009, Fishbein and Ajzen, 2010). Respondents were asked to free-list the responses to these eight questions. The surveys were recorded and responses transcribed. This process was repeated until no new answers were added to the total pool of responses given by the respondents (Ham et al., 2009).

Table 3.1. The eight questions of the elicitation survey.

Question	Type of Belief
What do you see as the advantages or good things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?	Behavioral
What do you see as the disadvantages or bad things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?	Behavioral
Who are the people or groups who would approve of, or who would encourage you, to not get close (~10cm) to the living reef (corals and other living organisms)?	Normative-Injunctive
Who are the people or groups who would disapprove of, or who would discourage you, from not getting close (~10cm) to the living reef (corals and other living organisms)?	Normative-Injunctive
Which of these people is most likely to not get close (~10cm) to the living reef (corals and other living organisms) today?	Normative-Descriptive
Which of these people is least likely to not get close (~10cm) to the living reef (corals and other living organisms) today?	Normative-Descriptive
Please list any factors or circumstances that would make it easy or enable you to not get close (~10cm) to the living reef (corals and other living organisms) today.	Control
Please list any factors or circumstances that would make it difficult or prevent you to not get close (~10cm) to the living reef (corals and other living organisms) today.	Control

The scuba divers that were monitored were grouped into different groups of compliance so as to distinguish those that comply (‘compliers’) from those that do not comply (‘non-compliers’) with the target behavior, and those that fall in between the two extremes (‘semi-compliers’). Personal observations revealed that most scuba divers come near to the reef substrate while scuba diving yet may or may not touch the reef substrate. When a scuba diver is within 10 cm of the reef substrate it becomes more a matter of chance whether they contact the substrate or not. Therefore, respondents were grouped using a cluster analysis and multidimensional scaling (MDS) plot examining their overall behavior for the duration of the scuba dive.

Responses to the eight elicitation questions were grouped into belief categories for each of the compliance groups. Each individual response to each question was assigned to a belief category that best described that response. The belief categories were identified from common themes that emerged from the responses. This process also avoided any duplication by respondents (an example of the duplication is listed in Table 3.2, 'complier' 1 and 19). These categories were identified (following the procedure suggested by Ham et al. (2009)) through a group discussion consisting of 3-4 people (apart from the researcher) to group the belief responses into belief categories. The persons who assisted with this group discussion were not involved with the research project. These persons were familiar with scuba diving and the Mombasa Marine Park and Reserve. Furthermore, they were asked by the researcher to volunteer their time. The author was the moderator during this group discussion and recorded the proceedings. During this group discussion any disagreements that arose were discussed within the group. If no agreement was reached the belief response was discarded from the pool of belief responses.

Table 3.2. An example of the grouping results of individual responses into broad belief categories. This table only shows responses from three compliers to the first question. The same would be completed for the non-compliers.

ID	Question: What do you see as the advantages or good things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?		
	Individual Responses	**Belief Category**	**Notes**
Complier 1	-do not damage anything -protect certain animals -protect yourself	-protection and preservation of reef -protection and preservation of reef -self protection	The first two responses are similar and fall into the same belief category ('protection and preservation of reef'). Only one of these two responses is counted within the belief category.
Complier 19	-protect coral -preservation of coral -no changes to wildlife behavior	-protection and preservation of reef -protection and preservation of reef -maintain wildlife	The first two responses are similar and fall into the same belief category ('protection and preservation of reef'). Only one of these two responses is counted within the belief category
Complier 29	-avoid damage to reef -avoid damage to self -not transmit anything to reef	-protection and preservation of reef -self protection -misc.	The first response falls into the 'protection and preservation of reef' category while the second response falls into the 'self protection' category. The third response falls into the miscellaneous category as it is not a common response.

The methods above were completed for the different compliance groups separately. These categories were then compared to the each other and their differences were examined. The following criteria were created by the researcher and used to determine which belief categories were of interest and could be used in communication efforts (a similar approach was used by Curtiss (2008)):

a. At least 25% of the belief responses had to be present in that belief category by one of the compliance groups (based on the cluster analysis and MDS plots),
b. The belief category was usable in communication messages (for example, a 'no idea' or a 'none' belief category was not usable in communication and was therefore not shortlisted),
c. The beliefs held by the groups differed significantly, or the belief category consisted of a high frequency of belief responses by one or more of the groups.

The sample size of the monitored scuba divers in the first phase consisted of 65 scuba divers.

3.3.2. Phase Two-Identification of Beliefs to Target with Interpretive Efforts

The second phase determined which of the salient beliefs from the first phase were the most effective to target in interpretive efforts. More scuba divers were monitored and administered a questionnaire. A questionnaire was created based on the short-listed salient beliefs of the first phase and also contained direct-measure questions regarding behavioral beliefs, normative beliefs and control beliefs. To ensure respondents understood the questions, the researcher was on-site at all times to answer questions should respondents not understand the questions. The direct measures for normative beliefs and control beliefs were measured on a 7-point scale while the direct behavioral belief used five bi-polar scales. The questions were derived from previous studies (Fishbein and Ajzen, 2010, Ham et al., 2009). This questionnaire included two measures for each short-listed salient belief carried forward: a strength measure, and, an evaluation, motivation to comply, and power measure for behavioral, normative and control beliefs respectively (Ham et al., 2009). The strength measures were scored using the following 7-point scales: behavioral belief strength (0 to 6), normative belief strength (-3 to +3) and the control belief strength (0 to 6). The second half of the belief measures were scored on the following 7-point scales: behavioral belief evaluation (-3 to +3), normative belief motivation to comply (0 to 6) and the control belief power (-3 to +3). For each belief a cross-product was calculated by multiplying the strength measure of each belief to the evaluation, motivation to comply and power measure for behavioral, normative and control beliefs respectively. The range of the cross-products was −18 to +18.

This questionnaire was then administered to subsequent scuba divers who were observed (using similar behavior monitored during the dive as previously described in the first phase) during their scuba dives. Scuba divers were labeled as either a 'complier' or 'non-complier' depending on whether they adhered to the target behavior or not. 'Compliers' were those divers who did not come within 10 cm of the reef substrate during their dive (behaved in accordance with the target behavior throughout the dive) and ‘non-compliers’ were those divers that came within 10 cm of the reef substrate during their dive (this also included any intentional and unintentional contacts with the reef; did not behave in accordance with the target behavior throughout the dive). The final step consisted of analyzing the differences between the questionnaire responses of the ‘compliers’ and ‘non-compliers’.

Table 3.3 shows how the cross-products of each belief can be interpreted. Extremely negative cross-products are expected to result in target behavior that is not carried out, as a result of that particular belief, while extremely high cross-products are expected to result in the performance of the target behavior as a result of that particular belief. Cross-products nearing 0 indicate that the belief is expected to have very little influence on the target behavior.

Table 3.3. The range of scores of the cross-products for each of the different beliefs, and how to interpret the high, low and mid scores for each.

Belief	Extremely negative cross-product (-18)	Zero cross product	Extremely positive cross-product (+18)
Behavioral Belief	Respondent believes it’s extremely likely that a bad outcome will result (strength = 6 and evaluation = -3)	Respondent believes the outcome will not occur (strength = 0), or, the respondent believes the outcome is neither good nor bad (evaluation = 0)	Respondent believes it’s extremely likely that a good outcome will result (strength = 6 and evaluation = 3)
Normative Belief	Respondent believes that the social referent would strongly disapprove of the behavior and furthermore, the respondent is extremely motivated to comply (strength = -3 and motivation to comply = 6)	Respondent believes that the social referent does not care about the behavior (strength = 0), or, the respondent is not motivated to comply (motivation to comply = 0)	Respondent believes that the social referent would strongly approve of the behavior and furthermore, the respondent is extremely motivated to comply (strength = 3 and motivation to comply = 6)
Control Belief	Respondent strongly believes that the factor is inhibiting (strength = 6 and power measure = -3)	Respondent believes that the factor does not exist (power = 0), or, the respondent is not sure if the factor would inhibit or facilitate the behavior (power measure = 0)	Respondent strongly believes that the factor is facilitating (strength = 6 and power measure = 3)

(Adapted from Ham et al. 2009)

The sample size of the monitored scuba divers in the second phase consisted of 94 scuba divers.

3.3.3. Statistical Analysis

To understand whether different salient beliefs underlie compliance behavior versus non-compliance behavior, cluster analysis and MDS (multidimensional scaling) plots were used in Primer to group scuba divers into groups differing in compliance during the first phase of the methodology. Chi-square tests were used to reveal differences in the belief categories between the different compliance groups. In the second phase of the methods, the responses to the questionnaires were analyzed using independent samples t-tests in SPSS.

3.4. Results: Scuba Divers-Salient Beliefs

3.4.1. Phase One

Phase One yielded a sample size of 65 participants. Using a cluster analysis and a MDS plot the respondents were grouped into 3 compliance groups: ‘compliers’ (40), ‘non-compliers’ (9) and ‘semi-compliers’ (16). For the cluster analysis the ‘non-complier’ differed from the other two groups at 70% level of similarity and the remaining two groups differed at 80% level of similarity. For the MDS plot the similarities were 80% and 85% respectively (Figure 3.1). The beliefs that adhered to the selection criteria, based on these compliance groups, were shortlisted for inclusion in phase two of the research project and are depicted in Table 3.4.

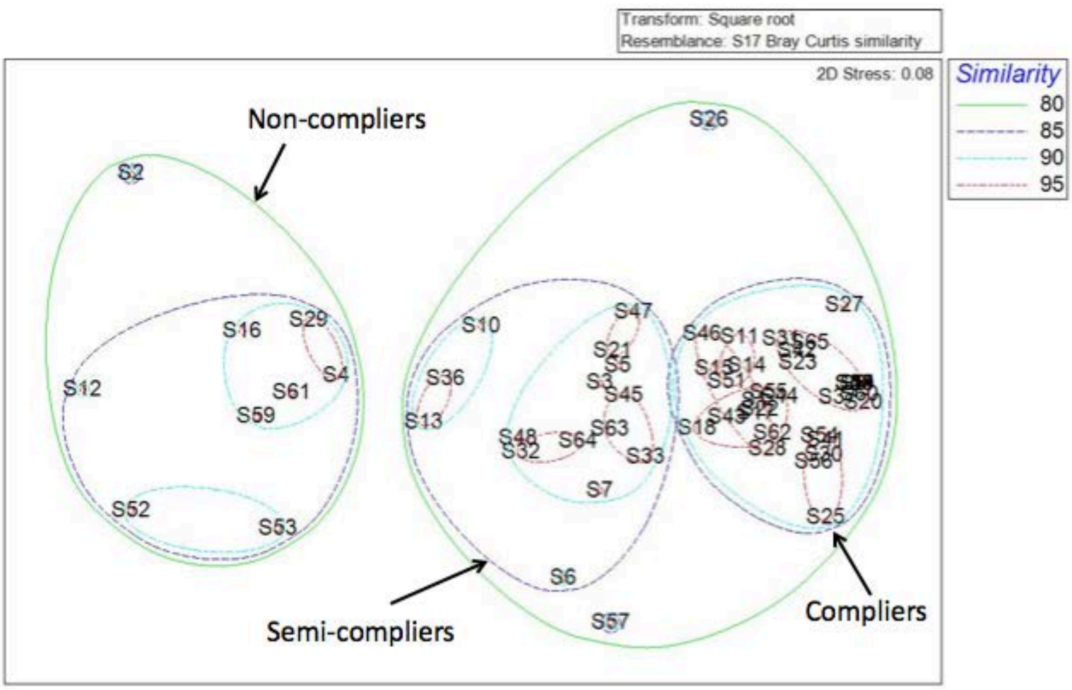


Figure 3.1. The MDS plot showing the three resultant groups of compliance for the scuba divers (n=65).

Table 3.4. The resultant beliefs of the scuba divers that met the selection criteria and that were carried forward for targeting in interpretive efforts. The numbers represent the number of respondents from each compliance group that shared that belief (and the percentage of that group).

Elicitation Question	Type of Belief	Belief Category	Compliers (n=40)	Non-compliers (n=9)	Semi-compliers (n=16)
What do you see as the advantages or good things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?	Behavioral	Protect the reef and ecosystem	35 (88%)	8 (89%)	15 (94%)
What do you see as the disadvantages or bad things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?	Behavioral	Can't see as much*	21 (53%)	6 (67%)	15 (94%)
Who are the people or groups who would approve of, or who would encourage you, to not get close (~10cm) to the living reef (corals and other living organisms)?	Normative (Injunctive)	Dive guide	32 (80%)	6 (67%)	12 (75%)
Which of these people is most likely to not get close (~10cm) to the living reef (corals and other living organisms) today?	Normative (Descriptive)	Dive guide*	36 (90%)	9 (100%)	10 (63%)
Please list any factors or circumstances that would make it easy or enable you to not get close (~10cm) to the living reef (corals and other living organisms) today.	Control	Buoyancy control*	11 (28%)	6 (67%)	12 (75%)
Please list any factors or circumstances that would make it difficult or prevent you to not get close (~10cm) to the living reef (corals and other living organisms) today.	Control	Water conditions	28 (70%)	7 (78%)	11 (69%)

**Indicates those beliefs that had significantly different frequencies across the three compliance groups (p=0.014 for behavioral belief, p=0.014 for the normative belief, and p=0.002 for the control belief; chi-square test, df=2, n=65; contingency table=3 categories of compliance vs. 2 categories of beliefs).*

3.4.2. Phase Two

The second phase of the research project differentiated between 'compliers' and 'non-compliers' for the first 15 minutes of the scuba dive, the second 15 minutes of the scuba dive and the first 30 minutes (first and second 15 minutes combined) of the scuba dive. The data were analyzed in 15-minute blocks because previous research (*Chapter 2*) had shown that more contacts were made in the first 15 minutes compared to the second 15 minutes of the scuba dive, indicating that interpretive efforts would be more effective in the first 15 minutes of the scuba dive. Table 3.5 indicates the number of 'compliers' and 'non-compliers' in each of the categories. A ‘complier’ in the first 15 minutes of the scuba dive indicates that he/she adhered to the target behavior for the first 15 minutes of the scuba dive only. A ‘complier’ in the second 15 minutes indicates that the target behavior was adhered to for the second 15 minutes of the dive only, and a ‘complier’ in the first 30 minutes of the scuba dive indicates that he/she adhered to the target behavior for the full 30 minutes. The same criteria were used to group the ‘non-compliers’. This classification was then used for the administering of the questionnaires.

Table 3.5. The number of compliers and non-compliers in the first 15 minutes, second 15 minutes, and first 30 minutes of the scuba dive. The number of compliers/non-compliers for each category indicates the number of divers that were compliers/non-compliers for that phase of the dive (either 1st or 2nd 15 minutes, and/or the entire 30 minutes).

	Compliers	Non-compliers
First 15 minutes	23	71
Second 15 minutes	43	51
First 30 minutes	16	78

Table 3.6 indicates the average results of the questionnaire for the ‘compliers’ and ‘non-compliers’ for the first 30 minutes of the scuba dive. The behavior throughout all three observation periods (1st 15 minutes, 2nd 15 minutes and 1st 30 minutes) of the scuba dive indicates that both ‘compliers’ and ‘non-compliers’ had very positive behavioral beliefs about protecting the reef (cross-product scores for ‘compliers’ and ‘non-compliers’ were 14.50 and 13.50 respectively (result of high strength and evaluation measures). For the second behavioral belief (not seeing as much is disadvantageous when not getting close to the reef) both ‘compliers’ and ‘non-compliers’ had low scores for both strength measures and evaluations (cross=products for ‘compliers’ and ‘non-compliers’ were −2.00 and −2.70). ‘Compliers’ and ‘non-compliers’ felt fairly strongly that guides were most likely not to get too close to the reef and both groups of scuba divers wanted to be like their dive guides (descriptive norm, high motivation to comply; cross-products for ‘compliers’ and ‘non-compliers’ were 9.27 and 9.22) and do what their dive guides thinks they should do (injunctive norm, high motivation to comply; cross-products for ‘compliers’ and ‘non-compliers’ were 11.10 and 11.40). Buoyancy control had high strength and power measures (cross-products for ‘compliers’ and ‘non-compliers’ were 11.90 and 12.00), indicating that both groups viewed buoyancy control as important for their ability to avoid approaching the reef. The remaining control belief, environmental conditions, was not scored as highly by either group due to moderate strength

and power measures (cross-products for 'compliers' and 'non-compliers' were 5.88 and 7.26). None of the differences of these measures were significant between 'compliers' and 'non-compliers' for the first 30 minutes of the scuba dive.

Table 3.6. Average strengths, evaluations, motivations to comply, power measures and cross-products of the salient beliefs about not getting close to the reef substrate while scuba diving for compliers (n=17) and non-compliers (n=86) (shown for the first 30 minutes of a scuba dive; independent samples t-test).

		Compliers	Non-compliers	Difference	p-value
Protect the reef (behavioral belief)	Strength	5.19	4.81	0.38	0.306
	Evaluation	2.75	2.81	0.06	0.676
	Cross-product	14.5	13.5	1.00	0.455
Not able to see as much (behavioral belief)	Strength	2.60	2.00	0.60	0.303
	Evaluation	-1.19	-1.36	0.17	0.624
	Cross-product	-2.00	-2.70	0.70	0.630
Dive guides most likely not to get close to reef (descr. norm. belief)	Strength	2.06	1.88	0.18	0.596
	Motivation to Comply	4.67	4.70	0.03	0.912
	Cross-product	9.27	9.22	0.29	0.980
Dive guides most likely to approve of me not getting close to reef (injunc. norm. belief)	Strength	2.06	2.09	0.30	0.947
	Motivation to Comply	5.13	5.42	0.29	0.225
	Cross-product	11.10	11.40	0.30	0.879
Buoyancy control would make it easier not to get close to reef (control belief)	Strength	2.25	2.30	0.05	0.892
	Power Measure	4.94	5.08	0.14	0.621
	Cross-product	11.90	12.00	0.10	0.963
Environmental conditions make it more difficult not to get close to reef (control belief)	Strength	4.50	4.96	0.46	0.325
	Power Measure	0.81	1.37	0.56	0.209
	Cross-product	5.88	7.26	1.38	0.535

When behavior is examined in the first 15 minutes of the scuba dive there is one significant difference from the results described for the first 30 minutes (Table 3.6): a larger difference exists between ‘compliers’ and ‘non-compliers’ for the second control belief (‘environmental conditions’: current, surge, visibility). The ‘non-compliers’ were significantly more likely to believe that environmental conditions can facilitate them from carrying out the target behavior (Table 3.7). The power measure and the associated cross-products for the ‘compliers’ and ‘non-compliers’ differed significantly (independent samples t-test, n=94; p=0.021 and 0.029 respectively). All other comparisons between the ‘compliers’ and ‘non-compliers’ for all the other beliefs were non-significant (p>0.05; full table listed in *Appendix 5*).

Table 3.7. Average strengths, power measures and cross-products of control belief (environmental conditions) about not getting close to the reef substrate while scuba diving for compliers (n=24) and non-compliers (n=79)(shown for the first 15 minutes of a scuba dive).

		Compliers	Non-compliers	Difference	p-value
conditions make it more difficult not to get close to reef (control belief)	Strength	4.65	4.96	0.31	0.311
	Power Measure	0.43*	1.55*	1.12	0.021
	Cross-product	3.13*	8.28*	5.15	0.029

**Indicates significant differences between the compliers and non-compliers (independent samples t-test, n=94).*

The overall attitude towards a behavior is expressed by adding up all the cross-products of the ‘compliers’ and ‘non-compliers’ (Table 3.8). No significant differences were found between the ‘compliers’ and ‘non-compliers’ for the three different time observation periods (p=0.232, p=0.150 and p=1.00 for the first 15 minutes, second 15 minutes, and first 30 minutes of the scuba dive; independent samples t-tests, n=94).

Table 3.8. The summation of all the cross-products of each belief for the compliers and non-compliers (n=94).

	First 15 minutes		Second 15 minutes		First 30 Minutes	
	Compliers	Non-compliers	Compliers	Non-compliers	Compliers	Non-compliers
Cross-product Summation	56.55	63.45	66.60	57.68	61.45	61.83

Specific direct measures (behavioral beliefs, normative beliefs and control beliefs) were also measured in the questionnaire and no significant differences were evident between the 'compliers' and 'non-compliers' for the different time periods of the scuba dive (first 15 minutes, second 15 minutes, and first 30 minutes of the scuba dive; independent samples t-test, n=94). These results for the first 30 minutes of the scuba dive are indicated in Table 3.9. The direct behavioral belief measure used five bipolar scales and the responses to these scales were averaged into one score. The Cronbach's Alpha coefficient was 0.896 for this attitude measure indicating that the scale was reliable.

Table 3.9. The average scores of the compliers and non-compliers for the direct-measure questions in the questionnaire for the first 30 minutes of the scuba dive (n=94).

Belief	Scale	Compliers	Non-compliers	p-value
*For me to not go near the reef (within 10cm) when scuba diving in the Mombasa Marine Park is	Average of five responses to bipolar scales (1-7)	2.01	2.30	0.392
Most people that are important to me think that I should not go near the reef (within 10cm) when scuba diving in the Mombasa Marine Park.	Agree (1) to disagree (7)	1.81	2.15	0.382
Most people whose opinions I value would approve of me not going near the reef (within 10cm) when scuba diving in the Mombasa Marine Park	Agree (1) to disagree (7)	2.81	3.21	0.549
I am confident that I will not go near the reef (within 10cm) while scuba diving in the Mombasa Marine Park.	Strongly agree (1) to strongly disagree (7)	2.06	2.30	0.542
I am confident that the environmental conditions will not affect me when it comes to not going near the reef (within 10cm) while scuba diving in the Mombasa Marine Park.	Strongly agree (1) to strongly disagree (7)	3.38	3.81	0.391

**This direct behavioral belief measure consisted of five bipolar scales to the attitude statement. The scores to these scales were averaged. The bipolar scales were 1) harmful/beneficial, 2) pleasant/unpleasant, 3) good/bad, 4) worthless/valuable and 5) enjoyable/unenjoyable.*

3.5. Discussion: Scuba Divers-Salient Beliefs

The first phase of the research presented in this chapter identified six salient beliefs that could be used in persuasive communications to influence scuba divers to not come within ~10cm to the living reef while scuba diving. Targeting all six of these salient beliefs prior to a scuba dive was deemed to be unrealistic due to the nature of the scuba diving industry in the Mombasa Marine Park and Reserve: short exposure time prior to departure (this brief time was used for a briefing of the upcoming scuba dives), and the loud environment while motoring out to the dive site (outboard engines). The briefing prior to the scuba dive was used to highlight the aspects of the dive sites, standard scuba dive procedures and various safety procedures of the dive plan. Such a briefing would have been able to target one or two salient beliefs using short sentences, but it is unrealistic that all six of the selected beliefs be targeted within the briefing. Without knowing exactly which of these beliefs were the true salient beliefs, choosing any over others would be equivalent to blindly choosing the beliefs (Ham, 2007, Ballantyne and Packer, 2005, Ballantyne et al., 1998). Therefore it was necessary to shorten the list of six beliefs into a list of maximum 2-3 beliefs.

The second phase revealed that ‘compliers’ and ‘non-compliers’ had similar feelings about the outcomes of five of the six beliefs determined from the first phase. Targeting these beliefs would be ineffective, as it would consist of telling scuba divers what they already know or what they already believe (Ham et al., 2009). The salient belief that therefore needed to be targeted was the one that the ‘compliers’ and ‘non-compliers’ felt differently about: the control belief that environmental conditions (current, surge, visibility) will make it easier for them (the scuba divers) to not get close to the living reef. This control belief only differed in the first 15 minutes of the scuba dive.

The resultant interpretation can be made more effective by closely examining where the differences lay between the ‘compliers’ and ‘non-compliers’. The two components that make up the salient belief described must also be compared between ‘compliers’ and ‘non-compliers’ (Ham et al., 2009). The power measure asked respondents if the environmental conditions make it more difficult not to get close to the reef, while the strength measure determines if the environmental conditions influence not getting close to the reef. This study revealed that the power measure (how easy or difficult the scuba divers believe the environmental conditions can influence them from avoiding the reef) is where the main difference exists between the ‘compliers’ and ‘non-compliers’. This power measure must be targeted to get the ‘non-compliers’ to think like the ‘compliers’ and exhibit compliance behavior. However, it must be noted that this salient belief (and its power measure) only differed in the first 15 minutes of the scuba dive, as a result of the behavior of the divers that were different between the first and second 15 minutes of the dive, and therefore any interpretive efforts should be focused on this area of the scuba dive. Previous research (*Chapter 2*) supports this as more contacts were found to have been made in the first 15 minutes of the scuba dive (the acclimatization period) compared to the second 15 minutes.

Scuba divers generally use the first 15 minutes of a scuba dive as an acclimatization period in which they can fine-tune their buoyancy, curb their anxieties and find their place in the three-dimensional world (Barker and Roberts, 2004, Di Franco et al., 2009, Camp and Fraser, 2012). Scuba divers in these first few minutes of the dive may feel very preoccupied with numerous variables that are present. Furthermore, this is compounded when they are faced with unfavorable environmental conditions resulting in increased apprehension. Therefore, interventions should be focused in assisting scuba divers throughout the first 15 minutes of the scuba dive to overcome their belief that environmental conditions will make it easier to avoid approaching the reef and that they will need to rely on their diving skills to avoid the reef.

Results from *Chapter 2* revealed that the first 15 minutes of a scuba dive resulted in more contacts with the reef substrate by the divers. Interpretive efforts are therefore needed during this period to safeguard marine resources. Interpretive efforts could be offered as brief informative sentences, or reminders immediately before getting into the water, or immediately before descending onto the reef. These reminders should target the salient belief (environmental conditions) and its power component. Alternatively, solutions that can also be suggested include maintaining a safe distance from the bottom should the environmental conditions be unfavorable. Interpretation does not need to consist of verbal cues only; rather, as interpretation also includes guidance during an activity (Luck, 2003, Moscardo et al., 2004, Zeppel, 2008), visual cues while diving from the dive guide may also have the desired effect. Therefore, it is proposed that when verbal reminders are further re-enforced by visual cues throughout the dive, the greatest effect can be achieved.

PART B: SALIENT BELIEFS OF SNORKELERS

3.6. Methods: Snorkelers-Salient Beliefs

The methods used to discover the salient beliefs snorkelers hold regarding a specific behavior were based on methods developed by Ham et al. (2009). The first step in this process involved identifying the specific behavior that needed to be influenced. For the snorkelers the selected behavior was 'not making contact with the living substrate (corals and other living organisms)'. This behavior was chosen because contact with the reef substrate can be a direct cause of damage to the environment (the reef).

Snorkeler behavior was observed during snorkel excursions to assist in determining the salient beliefs of snorkelers (identifying 'compliers' and 'non-compliers'). The snorkelers monitored in this chapter were the same snorkelers from *Chapter 2*. The monitoring was conducted by following snorkelers in the water at a distance of 2-3m for a duration of seven minutes. To avoid any non-natural behavior of the snorkelers, the snorkelers were not informed that they would be monitored during their in-water snorkel activity. If a snorkeler contacted the living reef intentionally, then he/she was labeled as a 'non-complier', (not behaving in compliance with the target behavior) otherwise the label of 'complier' (behaving in compliance with the target behavior) was assigned. Inferred decisions were made to label behaviors as either intentional or non-intentional based on how the snorkeler made the behavior and the surrounding context. All behavior actions were recorded on an underwater slate by the researcher (see monitoring slate template in *Appendix 4*).

After completion of the snorkeling activity the participants were approached and administered a survey designed to elicit their beliefs about not contacting the reef substrate when they snorkel. The survey consisted of eight verbal, preset, open-ended questions (Table 3.10) about behavioral beliefs, normative beliefs and control beliefs (Ham et al., 2009, Fishbein and Ajzen, 2010). Respondents were asked to free-list the responses to these eight questions. The surveys were recorded and responses transcribed. This process was repeated until no new answers were added to the total pool of responses given by the 'compliers' and 'non-compliers' (Ham et al., 2009).

Table 3.10. The eight questions of the elicitation survey.

Question	Type of Belief
What do you see as the advantages or good things that could result if you do not make contact with the living substrate (corals and other living organisms) today?	Behavioral
What do you see as the disadvantages or bad things that could result if you do not make contact with the living substrate (corals and other living organisms) today?	Behavioral
Who are the people or groups who would approve of, or who would encourage you, not to make contact with the living substrate (corals and other living organisms)?	Normative-Injunctive
Who are the people or groups who would disapprove of, or who would discourage you, not to make contact with the living substrate (corals and other living organisms)?	Normative-Injunctive
Which of these people is most likely not to make contact with the living substrate (corals and other living organisms) today?	Normative-Descriptive
Which of these people is least likely not to make contact with the living substrate (corals and other living organisms) today?	Normative-Descriptive
Please list any factors or circumstances that would make it easy or enable you not to make contact with the living substrate (corals and other living organisms) today.	Control
Please list any factors or circumstances that would make it difficult or prevent you not to make contact with the living substrate (corals and other living organisms) today.	Control

Responses to the eight elicitation questions were grouped into belief categories for each of the compliance groups. Each individual response to each question was assigned to a belief category that best described that response. The belief categories were identified from common themes that emerged from the responses. This process also avoided any duplication by respondents (an example of the duplication is listed in Table 3.11, ‘complier’ 19). These categories were identified (following the procedure suggested by Ham et al. (2009)) through a group discussion consisting of 3-4 people (apart from the researcher) to group the belief responses into belief categories. The persons who assisted with this group discussion were not involved with the research project. These persons were familiar with snorkeling and the Mombasa Marine Park and Reserve. Furthermore, they were asked by the researcher to volunteer their time. The author was the moderator during this group discussion and recorded the proceedings. During this group discussion any disagreements that arose were discussed within the group. If no agreement was reached the belief response was discarded from the pool of belief responses.

Table 3.11. An example of the grouping result of individual responses into broad belief categories. This table only shows responses from three compliers to the first question. The same would be completed for the non-compliers.

ID	Question: What do you see as the advantages or good things that could result if you do not make contact with the living substrate today?		
	Individual Responses	**Belief Category**	**Notes**
Complier 1	-do not damage anything -protect certain animals -protect yourself	-protection and preservation of reef -protection and preservation of reef -self protection	The first two responses are similar and fall into the same belief category (‘protection and preservation of reef’). Only one of these two responses is counted within the belief category.
Complier 19	-protect coral -preservation of coral -no changes to wildlife behavior	-protection and preservation of reef -protection and preservation of reef -maintain wildlife	The first two responses are similar and fall into the same belief category (‘protection and preservation of reef’). Only one of these two responses is counted within the belief category
Complier 29	-avoid damage to reef -avoid damage to self -not transmit anything to reef	-protection and preservation of reef -self protection -misc.	The first response falls into the ‘protection and preservation of reef’ category while the second response falls into the ‘self protection’ category. The third response falls into the miscellaneous category, as it is not a common response.

The methods above were completed for the ‘complier’ and ‘non-complier’ groups separately. These categories were then compared and their differences were examined. The following criteria were created by the researcher and used to determine which belief categories were of interest and could be used in communication efforts (a similar approach was used by Curtis (2008)):

a. At least 25% of the belief responses had to be present in that belief category by either ‘compliers’ or ‘non-compliers’,
b. The belief category was usable in communication messages (for example, a ‘no idea’ or a ‘none’ belief category was not usable in communication and was therefore not shortlisted) and,
c. The beliefs held by the ‘compliers’ and ‘non-compliers’ differed significantly (chi-square), or the belief category consisted of a high frequency of ‘complier’ and ‘non-complier’ belief responses.

The sample size consisted of 59 snorkelers.

3.6.1. Statistical Analysis

To understand whether different salient beliefs underlie compliance behavior versus non-compliance behavior, chi-square tests were used to differentiate the beliefs of the 'compliers' and the 'non-compliers' of the snorkelers. The responses to the elicitation survey of each respondent were labeled as either being present or absent within each belief category and then compared across the different compliance groups.

3.7. Results: Snorkelers-Salient Beliefs

The sample size of the snorkelers consisted of 32 'compliers' and 27 'non-compliers'. The salient beliefs that met the selection criteria are listed in Table 3.12. The beliefs depicted in this table were targeted in interpretive efforts aimed at snorkelers (*Appendix 1*). The bottom two control beliefs indicated in Table 3.12 refer to the same control belief and hence only one of them was used in interpretive efforts. The final shortlist of salient beliefs included one behavioral belief ('if I don't contact the reef, it will protect the reef'), three normative beliefs (two descriptive beliefs: 'the guides would approve of me not contacting the reef', and 'the guides would disapprove of me not contacting the reef', and one injunctive belief: 'the guides are most likely not to contact the reef') and two control beliefs ('deeper water would make it easier not to contact the reef' and 'more information/guidance would make it easier not to contact the reef').

Table 3.12. The salient beliefs of the snorkelers that met the selection criteria and subsequently carried forward for targeting in interpretive efforts.

Elicitation Question	Type of Belief	Belief Category	Compliers (n=32)	Non-compliers (n=27)
What do you see as the advantages or good things that could result if you do not make contact with the living substrate (corals and other living organisms) today?	Behavioral	Protect the reef (no damage)*	26 (81%)	15 (56%)
Who are the people or groups who would approve of, or who would encourage you, not to make contact with the living substrate (corals and other living organisms)?	Normative (Injunctive)	Guides/operators	16 (50%)	12 (44%)
Who are the people or groups who would disapprove of, or who would discourage you, not to make contact with the living substrate (corals and other living organisms)?	Normative (Injunctive)	Guides/operators*	2 (6%)	7 (26%)
Which of these people is most likely not to make contact with the living substrate (corals and other living organisms) today?	Normative (Descriptive)	Guides/operators	18 (56%)	17 (63%)
Please list any factors or circumstances that would make it easy or enable you not to make contact with the living substrate (corals and other living organisms) today.	Control	More information and guidance	15 (47%)	10 (37%)
Please list any factors or circumstances that would make it easy or enable you not to make contact with the living substrate (corals and other living organisms) today.	Control	Deeper water	14 (44%)	8 (30%)
Please list any factors or circumstances that would make it difficult or prevent you not to make contact with the living substrate (corals and other living organisms) today.	Control	Shallow Areas	10 (31%)	8 (30%)

**Indicates those beliefs that were significantly different across the groups (p=0.033 for behavioral belief and p=0.036 for the normative belief; chi-square test, df=1, n=59; contingency table=2 categories of compliance vs. 2 categories of beliefs).*

3.8. Discussion: Snorkelers-Salient Beliefs

This research revealed six beliefs that could be targeted with interpretive efforts. Most of the beliefs identified for use in interpretive efforts were normative beliefs (three) and only one behavioral belief was identified. Other research has shown that behavioral beliefs are the most influential beliefs, followed by normative beliefs, while control beliefs are rarely of importance in protected area settings (Ham et al., 2009). These other studies (summarized in Ham, Brown et al. 2009) were all conducted in terrestrial settings and to date, this methodology has not been applied in a marine setting. The marine environment offers a three-dimensional experience to the user, compared to a two-dimensional one in terrestrial settings, and this may explain why control beliefs are more important in marine environments.

Only one behavioral belief differed significantly between the ‘compliers’ and ‘non-compliers’. The remaining behavioral beliefs either did not differ significantly or were not cited frequently enough to warrant inclusion in the shortlist. The belief that not contacting the reef substrate could lead to an increase in reef protection is a belief that was held by more ‘compliers’. Reasons that could explain this difference could include: the ‘non-compliers’ do not believe coral reefs to be alive, or perhaps they do not believe that contact results in damage (lack of knowledge or being unaware of the consequences of one’s actions (Marion and Reid, 2007, Bradley, 1979)). These reasons can be incorporated into interpretive efforts in an attempt to target this salient belief (Madin and Fenton, 2004).

There were three normative beliefs that were shortlisted but only one differed between the compliant snorkelers and non-compliant snorkelers. The belief that differed was a descriptive belief with the ‘non-compliers’ believing that the guides (people who guide) would disapprove of them (the snorkelers) not contacting the reef (i.e. approve of contacting the reef). Interpretive efforts should therefore include messages that target this belief by convincing ‘non-compliers’ that the guides may not approve of them contacting the reef. However, the remaining two normative beliefs also need to be targeted as differences might become more apparent when the two aspects of each normative belief are measured (how strongly respondent believes social referents would approve/disapprove of the behavior, and the respondent’s motivation to comply).

Two control beliefs were identified for the snorkelers who complied and those who did not. Water depth was one control belief highlighted as something that would facilitate adhering to the target behavior. A usual snorkel excursion consists of the guide leading the snorkelers throughout the coral reef area while the snorkelers diligently follow (personal observation of the researcher). This practice would make the visitors believe that they did not have as much control as they would like when considering the target behavior. The second control belief (more information/guidance) is again something that is beyond the control of the visitors as this is something that must be forthcoming from the guide or crew on the boat. These control beliefs focus on avoiding shallow water and being presented with more information, both actions that the guide is directly responsible for. The latter is one that could easily and logically combine with the behavioral belief (reefs would be protected) as the one asks for information (control belief) and the other requires it (behavioral belief).

The discovery of the salient beliefs that snorkelers have regarding ‘not contacting the reef substrate’ when they snorkel is a crucial step if the ultimate goal is to influence the behavior of snorkelers. These salient beliefs can be targeted by persuasive communications. The result could include changing the underlying beliefs, which in turn could alter the attitudes, norms and/or perceived behavioral control of snorkelers. Ultimately, the behavior of snorkelers could then be altered. When the interpretive efforts have an extended exposure time with the audience, or when there are repetitive interactions with the audience it is acceptable to target the salient beliefs identified in the first phase of such a study (Ham pers comm. 2010, Powell 2008, Breckler 2006, Newhouse 1990). However, if an interpretation program is designed so that there is only a brief, one-off encounter with the audience, then the list of identified salient beliefs would have to be shortened to only two or three salient beliefs. Targeting any more than three different salient beliefs in a brief encounter (such as a signboard) is neither practical nor efficient.

To summarize, six salient beliefs snorkelers hold when it comes to ‘not contacting the reef substrate’ while snorkeling were identified. These salient beliefs are comprised of behavioral, normative and control beliefs, and all are addressable in interpretive efforts through the guide. The guide is the preconceived role-model that visitors expect to model their behavior on (Littlefair, 2003, Moscardo et al., 2004, Skanavis and Giannoulis, 2009). Furthermore, visitors expect to absorb the messages guides pass on to them (Littlefair, 2003). These factors make guides the most effective medium to influence the behavior of snorkelers by using interpretation to address these salient beliefs.

3.9. Conclusion: Scuba Divers and Snorkelers

Scuba divers and snorkelers in the Mombasa Marine Park and Reserve are most influenced by normative beliefs, and in particular of how the guide (people who guide) behaves and expects the visitors to behave. This influence of guides has been demonstrated in various publications. Guides tend to act as motivators in getting visitors to respect wildlife or adopt pro-environmental practices (Skanavis and Giannoulis, 2009, Zeppel, 2008, Zeppel and Muloin, 2008, Black and Ham, 2005). The use of guides is also the most effective method of conveying interpretive messages (Luck, 2003). These two aspects of guides (motivator and efficient conveyor) are considered to be representative of all guides by visitors to an unknown area, thus establishing trust by the visitor towards the guide (Zeppel, 2008, Skanavis and Giannoulis, 2009). Guides should therefore be included in any interpretive efforts as: a) the guide's behavior needs to become proper role-model behavior; and b) snorkelers are expected to mimic the behavior of the guide.

When examining the identified beliefs, it becomes evident that guides (people who guide) hold the key to successful implementation of interpretation and adherence to the target behavior (not contacting the reef substrate). Visitors who will partake in these excursions will most likely have certain expectations of their guide in believing that the actions and voice of the guide are the best actions to be mirrored (the guide is a role-model) and voice to be listened to (what is permissible and what is not permissible). Interpretation also includes guidance throughout the activity, and as guides are in the water with the scuba divers and snorkelers, they are best placed to deliver this aspect of interpretation. Barker and Roberts (2004) showed in their study of diver impacts in St Lucia that impacts were reduced through dive leader (guide) intervention. Both scuba divers and snorkelers held guides in high esteem throughout this current study and this trait could indicate that they would appreciate the intervention of the guides in protecting the resources (another salient belief shared by scuba divers and snorkelers). This sense of appreciation was also reported by Barker and Roberts in their study (2004). The use of guides is therefore the most appropriate delivery method of the TORE™-based interpretation aimed at reducing potentially damaging contacts to the reef substrate.

Control beliefs are rarely shortlisted as beliefs to target in protected area settings as protected area managers often do not expect visitors to engage in activities that are beyond their control or they feel incapable of doing (Ham et al., 2009). This reasoning however might be more appropriate for terrestrial protected areas where people are more in control of how they behave (often due to physical barriers or trails). This study focused on visitors scuba diving and snorkeling in a marine protected area and the target behavior (not contacting the reef substrate) was open to various influences that could have led these visitors to believe they did not have complete control. Being in a marine environment and engaging in scuba diving or snorkeling activity requires a certain degree of skill (diving, swimming and snorkeling). Water conditions such as visibility (investigated and no influence found, *Chapter 2*), current (investigated and little influence found, *Chapter 2*), wind creating surface waves (not measured), surge (investigated and no influence found, *Chapter 2*) and depth of water for the snorkelers (not measured but controlled by guides leading the snorkel excursion) are all factors that could greatly influence the ease or difficulty with which a visitor scuba dives or snorkels, and how much control they perceive they have on performing the target behavior. Furthermore, scuba divers and snorkelers have greater freedom to disperse than their terrestrial counterparts since there are fewer physical barriers (Plathong et al., 2000), and especially with scuba diving due to the three dimensional environment (Agardy, 2000). Agardy argues that the application of a terrestrial model to a marine environment: "may not succeed in protecting resources" (p. 876) due to the physical differences between the two environments.

Interpretive efforts will aim to make the 'non-compliers' think like the 'compliers' regarding the target behavior. If the 'non-compliers' believe that environmental conditions will make them stay further from the reef, yet contact the reef more often, interpretation should aim to change this belief, or offer alternative solutions, such as maintaining distance from the reef while diving over it, especially when environmental conditions (current, surge, visibility) are not favorable. Creating themes based on these salient beliefs should be more effective (Ham, 2007, Ballantyne and Packer, 2005, Ballantyne et al., 1998) than those themes selected by resource managers who believed they knew what recreational resource users were thinking. Research has shown that resource managers and resource users think very differently about perceptions of achieving similar goals (Glaspell et al., 2003, Watson and Roggenbuck, 1998, Absher et al., 1988). One challenge that does remain is that: "many interpretive encounters are simply too short lived for lasting attitude impacts to occur readily" (Ham 2007, p. 44). The scuba diving activities have a short window of opportunity in delivering any interpretive efforts yet due to the nature of the diving industry in Mombasa (double dives on an excursion), a relatively long period for interventions. The snorkelers have a longer window of opportunity and a shorter intervention period due to the shorter snorkel times.

In conclusion, interpretive efforts aimed at scuba divers and snorkelers can best be delivered by the guides (people who guide) of those excursions. These guides can effectively target the salient beliefs identified in this study by utilizing the trust that comes with their position. Scuba divers would benefit most by having interpretive efforts aimed at the first 15 minutes (the acclimatization period) of the scuba dive and focusing on how to best deal with the water conditions. Snorkelers would benefit best by extended interpretive efforts making use of available information to deliver to their clients, and by the guides (and therefore the users) avoiding shallow water during snorkeling activities.

One limitation of the study existed regarding the wording of the elicitation survey (phase one) and the scuba diver questionnaire (phase two). The wording of these survey tools was based on well-established, standardized methods for collecting data. The questions were preset that required only the insertion of the target behavior. Most studies completed using these methods used target behaviors that were positive (e.g. “stay on the trail”) whilst this current study used a behavior that was negative (“do not come close to or touch the reef”). This created some questions with double negatives that may have created confusion about what the question was asking. To ensure respondents understood the questions, the researcher was on-site at all times to answer questions should respondents not understand the questions. More research examining the use of negative behaviors is recommended to avoid such issues in future studies.

The next chapter will use these identified salient beliefs of the snorkelers and test the efficacy of an interpretation program. The study will determine if addressing these salient beliefs will result in fewer damaging contacts to the reef substrate.

Chapter 4: Testing How Interpretation May Influence Snorkeler Behavior in the Mombasa Marine Park and Reserve, Kenya

4.1. Introduction

Effective interpretation aimed at influencing the behavior of resource users is based on an understanding of behavior theory. The previous chapter outlined the salient beliefs of snorkelers in the Mombasa Marine Park and Reserve that should be targeted to influence behavior and minimize the impacts on marine resources. The identified salient beliefs could be addressed in interpretive efforts (*Appendix 1*). Furthermore, the salient beliefs identified in the previous chapter addressed issues such as the provision of more information, the guides acting like role-models, and the respect snorkelers have for their snorkel guides. As a result, the snorkel guides were best-placed to be an integral part of the resultant interpretive efforts. These interpretive efforts could also influence the behavior of the guides. The short-listed salient beliefs were also to be used to enhance clientele satisfaction, increase resource awareness of the surrounding area and create business potential for the snorkel operators.

Given the results of *Chapter 2*, and the global degradation of coral reefs, a strong need exists to manage marine resources and/or marine resource users (Marion and Rogers, 1994, Hammitt and Cole, 1998). Influencing the behavior of snorkelers so that it is less damaging to the environment is one management strategy that can be used to reduce the impacts of visitors. Negative impacts could include intentional or non-intentional (accidental) contacts with the reef substrate (such as standing or touching), resulting in damage to the resources. Interpretation is a tool that can be used to bring about behavior change (Mayes and Richins, 2008, Skanavis and Giannoulis, 2009). Interpretation is the process of conveying a message to someone to enhance the awareness and appreciation that the person has with their surroundings. Providing easily understood interpretive messages to visitors helps them to better appreciate the natural surroundings and their own role in protecting them. The steps involved in conveying interpretive messages include information, assistance, guidance and engaging in activity. This study examines the effectiveness of interpretation in influencing the behavior of snorkelers in the Mombasa Marine Park and Reserve in the context of minimizing damage to the marine environment. The next section explains the various components of interpretation.

4.1.1. Theoretical Framework

Interpretation

Interpretation is a process that is often used to make recipients better aware of their relationship with the natural environment by stimulating interest and enthusiasm (Alcock, 1991, Luck, 2003, Orams, 1996a). Interpretation often includes first-hand experiences with this natural environment (Zeppel, 2008), and it: "assists the visitor to appreciate the area" (Luck 2003, p.943). The most commonly used definition of interpretation is one developed by Tilden (1957):

> an educational activity which aims to reveal meanings and relationships through the use of original objects, by first hand experience, and by illustrative media, rather than simply to communicate factual information (p. 8).

Clients often identify interpretation as an important factor in their enjoyment of an excursion (Moscardo, 1996). Interpretation programs use a variety of methods to get a message across to an audience, such as signs, trails, brochures, guides (people who guide) and visitor centers (Zeppel, 2008). Interpretation programs seek to stimulate interest, promote learning, guide visitors in appropriate behavior and encourage enjoyment. Effective interpretation programs make use of all these ingredients, leading to visitor attitudes and behavior being influenced and resulting in changes to both (Zeppel and Muloin, 2008, Mayes and Richins, 2008, Orams and Hill, 1998). This influence can have one of three outcomes: change existing attitudes, reinforce existing attitudes or create a new attitude towards a particular behavior (Ham, 2007). Various authors believe that the creation of new attitudes and behavior is the aim of interpretation (Ham, 2007, Pastorelli, 1998, Orams, 1996a).

It is essential to incorporate an understanding of behavior and behavior change into interpretation programs to make them more effective. This is something that has been lacking with many interpretation programs (Darnton, 2008, Ham, 2007, Madin and Fenton, 2004, McKenzie-Mohr, 2000, Tanner, 1999, Pastorelli, 1998, Orams, 1996b, Orams, 1997, Orams, 1994, Ham and Krumpe, 1996). An interpretation program could be designed to target the cognitive domain, affective domain or behavioral domain of its audience to bring about behavior change through influencing attitudes. Examples of behavior changes known to be linked to interpretation include less inappropriate behavior at a wild dolphin feeding tour (Orams and Hill, 1998), collecting rubbish while walking on a track (Ham et al., 2009), not feeding birds at a picnic site (Ham et al., 2009), reporting of conservation behavior following a sea turtle interpretive program (Howard, 2000), intended conservation behavior following a dolphin excursion (Mayes and Richins, 2008), donating to a conservation charity (Powell and Ham, 2008) and various other examples as listed in Zeppel (2008). Some of these attitude and behavior changes can translate into off-site pro-conservation efforts as well (Orams, 1997, Zeppel, 2008, Zeppel and Muloin, 2008) and/or long-term behavior change benefits (Mayes and Richins, 2008, Zeppel and Muloin, 2008). However, current interpretation programs used in natural resource management are not abundant; suffer from limitations; and are often poorly designed (see *Chapter 1*: Orams 1996, Tanner 1999, Stern 2005, Marion and Reid 2007).

Elaboration

Elaboration is one of the outputs interpretation aims to achieve (Ham et al., 2009). Elaboration refers to the careful analysis of, and critical thinking about, a particular message (Manfredo and Bright, 1991). When a message is carefully considered (high elaboration) and accepted, it creates an attitude in a similar manner. This new attitude now becomes an argument for future messages that attempt to influence the behavior of the recreational resource user. Increased critical thinking (elaboration) of a message can result in long-lasting attitude and behavior changes while shorter elaboration will result in short-lasting attitude and/or behavior changes (Manfredo and Bright, 1991). Factors that can affect the amount of elaboration a person experiences include: prior knowledge, direct exposure, and topic involvement (see *Chapter 1, section 1.2.3* and Figure 1.5 for a more detailed description of these factors).

Evaluation of Interpretation

Measuring the efficacy of these interpretation programs is essential to their success. Evaluating a program can demonstrate its worth, offer an opportunity to improve itself, measure impacts or outcomes, assessment of program process and promote conservation education (Jacobson, 1991, Ham and Weiler, 2006). The worth of a program can be determined by answering questions such as: ‘Who is the program intended for?’, ‘What is the purpose of the program?’, and ‘What are the available resources?’ (Ham and Weiler, 2006). Answers to these questions can determine if a program is actually needed. Evaluations of interpretive programs also determine if the interpretive program is reaching the desired audience and getting intended messages across to this audience. Any shortcomings in the interpretive program can then be addressed. Evaluating impacts also reveals if desired outcomes were achieved through interpretive efforts.

Numerous authors have used different approaches to measuring efficacy (Ham and Weiler, 2006). Ham and Weiler (2006) evaluated the effectiveness of interpretation programs, examining 10 common techniques that can be used to address efficacy of the interpretive efforts. These 10 techniques use the following methods: self-testing devices, visitor employed photography, observations, questionnaires, interviews, focus groups and personal meaning mapping methods (Ham and Weiler, 2006). Two of these techniques were used to gauge the effectiveness of the interpretation program in the Mombasa Marine Park and Reserve (this research project): observation of audience behavior after an interpretive program, and audience questionnaires. These methods were chosen due to logistical and time constraints within the research project.

Observing the behavior of snorkelers after they have received some form of interpretation will reveal if interpretive efforts have influenced behavior. Questionnaires are the most common method for eliciting information to evaluate interpretation programs (Ham and Weiler, 2006). These instruments can be used to gather information on the cognitive (what recreational resource users might think as a result of interpretation) and affective (what recreational resource users might feel as a result of interpretation) constructs (Ham and Weiler, 2006).

Complications may arise when measuring effectiveness of interpretive efforts. One of these complications is that measuring behavior is often time-consuming and therefore expensive (Ham and Weiler, 2006). Another complication arises when interpretation deals with visiting, or transient, recreational resource users (tourists), as they do not reside in the immediate vicinity. Since these resource users are visiting, often a new area, it is difficult to approach them for questionnaires (their time is valuable). Furthermore, observing their behavior in the long term is nigh impossible (Forestell, 1993). Also, changing attitudes during the brief duration of many interpretive programs is difficult (Ham, 2007, Orams, 1994). However, if the immediate goal is to protect local resources, then short-term changes are still an acceptable outcome.

Visitor Experience

Resource management is influenced by the way visitors experience a natural resource. This is an important, contributing factor to resource management. Moscardo (1996) states: “interpretation is the key to ensuring the quality of the tourist experience” (p. 376). Interpretation has also been shown to be effective in increasing visitor enjoyment (Weiler and Davis, 1993, Luck, 2003, Orams, 1996a). Increasing visitor enjoyment and pro-environmental behavior are vitally important as nature-based tourism grows in importance (Orams, 1996a, Buckley, 2000, Madin and Fenton, 2004). Studies have shown that recreational resource users are receptive to interpretation and furthermore exhibit a desire to increase their understanding of the environment through the acquisition of information (Aiello, 1998, Luck, 2003, Moscardo et al., 2004). Interpretive efforts must therefore maintain the attention span of the audience or risk losing their interest. A captivated audience is more likely to listen to the messages contained within the interpretation, absorb the content of those messages, and behave accordingly. This process implies a quality-effect relationship between interpretation and visitor experience. Enjoyment of an interpretive program by itself has been shown to create a positive attitude change and acceptance of pro-environmental behavior or resource management philosophy (Moscardo, 1999, Moscardo et al., 2004).

The TORE™ Model of Persuasive Communication

Interpretive programs must be carefully designed and implemented. Understanding the learning process and underlying behavior theory are crucial so that interpretation campaigns can be directed in an effective, enticing and efficient manner (Orams, 1996b, Orams, 1997, Tanner, 1999, Darnton, 2008). The salient beliefs (the most important beliefs underlying the various components of behavior models that are considered instrumental in the resultant behavior) must be addressed to achieve successful interpretation (Ham et al., 2009, Ballantyne and Packer, 2005, Ballantyne et al., 1998, Ham and Krumpe, 1996). Educational psychology has been researched thoroughly; however, little of this has been put to use in environmental interpretation, behavior and management fields (Orams, 1996a, Cole et al., 1997, Beaumont, 1998, Tanner, 1999) despite its obvious importance (McKenzie-Mohr, 2000). The interpretation program studied in this research project was based on the TORE™ method developed by Ham (2007).

The TORE™ (Thematic, Organized, Relevant and Enjoyable) model uses the frameworks of the Theory of Planned Behavior (TPB) and the Elaboration Likelihood Model (ELM) to guide communication efforts in the interpretation program (see *Chapter 1, section 1.2.3* for a more detailed description of the TORE™ process). The themes that are chosen to underlie the messages are the salient beliefs regarding a particular behavior. A theme-relevant message is delivered that provokes the audience to elaborate. If sufficient elaboration occurs then underlying beliefs are altered, leading to a change of attitudes that will then result in a change of behavior (Figure 1.6 in *section 1.2.3 of the Literature Review*). These steps are the pathway of the central or long-lasting behavior change route to persuasion in the ELM (Figure 1.4 in *section 1.2.3 of the Literature Review*). If the elaboration is not strong enough, the attitudes and resultant behavior may change, but the underlying beliefs will remain unaltered. This peripheral route will therefore also lead to behavior change but it will be of short-lasting effect. Numerous studies have shown that the TORE™ model can be a successful method of changing behavior (Anonymous, 2012, Ham et al., 2009, Powell and Ham, 2008, Wearing et al., 2008, O'Brien, 2000, Ham, 2003, Ham, 1992, Armstrong and Weiler, 2003).

4.1.2. Aims of this Study

This chapter examines the efficacy of an interpretation program in changing the immediate behavior of snorkelers. This interpretation program (*Appendix 1*) was designed specifically for recreational snorkeling in the Mombasa Marine Park and Reserve, Kenya by targeting the salient beliefs of these snorkelers. The salient beliefs identified were then addressed through interpretation that was delivered by snorkel guides. Research has shown that effective guides can create more enjoyable experiences for clients (Weiler, 1999, Haig, 1997, Geva and Goldman, 1991, Doherty, 1998); however, various authors assert that more research is needed on this topic (Moscardo et al., 2004, Anderson et al., 2003). This study assessed visitor impacts on the reef as well as visitor experience to determine the efficacy of the interpretation program with regards to influencing behavior and experiences. The goals of the interpretation program therefore included decreased impact on the reef and enhanced visitor satisfaction. Interpretation studies often do not measure visitor behavior as it is time-consuming and therefore expensive (Ham and Weiler, 2006). This study measured actual behavior of the snorkelers to acquire accurate behavior data. This study's overall research question was whether interpretation was effective in influencing behavior and clientele experience of the snorkelers in the Mombasa Marine Park and Reserve. More specifically, this study sought to answer the following questions:

1. To what extent can interpretation influence the snorkel behavior of the guides?
2. To what extent can guide-delivered interpretation influence the behavior of the snorkelers?
3. To what extent can guide-delivered interpretation enhance visitor satisfaction of the snorkelers?

4.2. Methods

4.2.1. Overview of Methods

This study was conducted in the Mombasa Marine Park and Reserve, Kenya. All snorkeling excursions that are included in this study were conducted in the Mombasa Marine Park. The snorkeling excursions only frequented patch reefs within the lagoon of the park. The methods consisted of gathering questionnaire data and monitoring snorkel behavior of snorkelers and their guides during their snorkel activities. These methods are discussed in more detail below.

4.2.2. Previous Study

A previous study (*Chapter 3*) uncovered the salient beliefs of snorkelers in the context of contacting the reef substrate in the Mombasa Marine Park and Reserve, Kenya. These salient beliefs (Table 4.1) were incorporated into interpretive training for snorkel guides and materials using the TORE™ model of persuasive communication (see *Appendix 1*). The effects of the resultant interpretation were the focus of this study.

Table 4.1. Salient beliefs of snorkelers in the Mombasa Marine Park, Kenya (*Chapter 3*).

Salient Belief	Type of Belief
Reef Protection is an advantage when not contacting the living reef	Behavioral belief
Guides would approve of me not contacting the living reef	Injunctive belief
Guides would disapprove of me not contacting the living reef	Injunctive belief
Guides are most likely not to contact the reef	Descriptive belief
Deeper water would make it easier not to contact the living reef	Control belief
More information would make it easier not to contact the living reef	Control belief

4.2.3. The Research Design

The research involved collecting data regarding the snorkel behavior of the guides before the implementation of an interpretive program and after the implementation of the interpretive program. The guides were followed in the water during the snorkel portion of an excursion and their interactions with the coral reef were recorded. The snorkel guides monitored before and after implementation of the interpretation program belonged to the same pool of snorkel guides but their individual identities were not recorded.

Data were also collected regarding a snorkeler's behavioral intent, actual snorkeling behavior and his/her experience (Figure 4.1). At the start of an excursion each snorkeling visitor was asked to complete a pre-excursion questionnaire. This questionnaire contained questions about the snorkeler's underlying beliefs (of attitudes, norms and perceived behavioral control) and behavioral intent about contacting the reef substrate while snorkeling. The underlying beliefs are those beliefs that cumulatively shape one's attitude toward something (positive or negative evaluation of something), normative feelings about something (what will others think about performing a behavior) and perceived behavioral control towards something (being able to perform the behavior). The questionnaire also sought the participant's prior knowledge concerning marine ecosystems to determine their existing knowledge of marine ecosystems.

This questionnaire was completed before any resource interaction occurred. Once the boat arrived at the snorkel site the snorkelers were followed in the water during the snorkeling portion of the excursion and their interactions with the coral reef were recorded. Upon completion of the excursion the participants were asked to complete a post-excursion questionnaire about their experience throughout the snorkel excursion. Data collected in this manner were labeled as the WITHOUT interpretation group. When sufficient data (approximate sample size of 100 determined by time constraints) had been collected a training workshop was conducted for the snorkel operators. This workshop aimed to introduce interpretive practices into the snorkeling excursion and targeted key salient beliefs outlined earlier (Table 4.1). Following the completion of the guide training workshop, pre- and post-excursion questionnaires, and the in-water monitoring were repeated until a similar sample size was collected. This data group was labeled as the WITH interpretation group. All participants were chosen by approaching the first boat with clients from the busiest departure point in the park. If the clients refused, or they stated that they would not snorkel, the next boat was approached. There was no overlap of participants between the WITHOUT and WITH groups as they were separated by a two-month period.

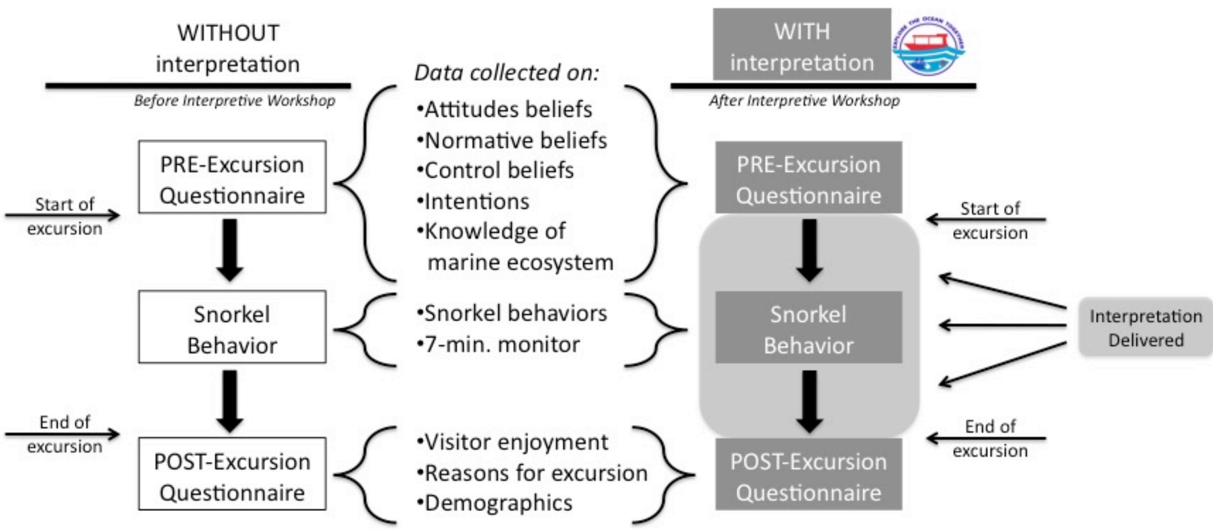


Figure 4.1. The research design showing the different stages of data collection. The shaded area in the WITH group shows when the interpretation was delivered.

4.2.4. Questionnaire Design

The pre-excursion questionnaire (completed prior to any resource use and interpretation) was designed to obtain a participant’s behavioral beliefs, normative beliefs, control beliefs and behavioral intention. These questions were Likert-scaled bi-polar statements on a 7-point scale and derived from past studies (Fishbein and Ajzen, 2010, Francis et al., 2004). Furthermore, a small section was dedicated to obtain the knowledge level of the participant regarding marine ecosystems using multiple-choice questions. The post-excursion questionnaire (completed at the end of the snorkeling excursion) was comprised of five parts: general responses about the participant's snorkel excursion, evaluation of the participant's snorkel excursion, feelings towards marine park attributes, planned future excursions and basic demographics. The questionnaire also included five questions used to measure the amount of elaboration. The elaboration or critical thinking of a particular topic of the presentation and/or guided activities was measured by using five, 7-scaled, pre-set and pre-tested questions (Wearing et al., 2008, Ham and Weiler, 2005). These questions could not distinguish which particular topics made the participant think critically, but rather measured the amount of critical thinking as a result of the entire excursion (presentation and/or guided activities). The questions of the post-excursion questionnaire consisted of Likert-scaled, bi-polar statements (either 5 or 7-point scales) and multiple-choice questions. Both questionnaires were pre-tested for clarity and comprehension, by 89 and 79 participants for the pre- and post-questionnaire respectively, and any questions/wording that were ambiguous or unclear were modified or discarded. The questionnaires were available in English, French and German. The French and German translations were translated into the respective languages by one native speaker and then translated back into English by another native speaker. Any discrepancies were discussed and clarified.

4.2.5. Snorkel Behavior

To determine the interactions snorkelers and/or snorkel guides have with marine resources, it was necessary to monitor their in-water snorkel behavior. This behavior was monitored by following the snorkelers and/or snorkel guides in the water at a distance of 2-3m for a duration of seven minutes and noting down their behavior. Monitoring of the snorkelers and/or snorkel guides was only completed in water depth where the snorkelers and/or snorkel guides had the option of contacting the reef substrate, and was temporarily halted when snorkelers and/or snorkel guides entered water that was too deep for them to be able to make contact with the reef substrate. Snorkelers and/or snorkel guides were not informed that they were being monitored. Multiple snorkelers (including guides) were monitored simultaneously when permitted by visibility and group dispersion of the snorkelers and/or snorkel guide. All behavior actions were recorded on an underwater slate by the researcher (see monitoring slate template in *Appendix 4*). For the subsequent analysis the behavior was transformed to the equivalent of a 30-minute period, as not all snorkelers and/or snorkel guides could be monitored for the full seven minutes and a 30-minute period best reflected the average snorkel time of the snorkelers visiting the Mombasa Marine Park and Reserve. The extrapolated 30-minute period was not to be considered indicative of actual contacts within a 30-minute period, rather, it was used to facilitate comparison.

The definitions of the recorded behaviors are shown in Table 4.2. Initially 12 separate actions were recorded but subsequently grouped into five different actions to more adequately reflect the messages conveyed by the workshop (Table 4.3: left side). Some of the actions were also grouped into behavior categories that were compared for differences between the WITH and WITHOUT interpretation groups (Table 4.3: right side).

Table 4.2. Definitions of actions for monitoring of snorkelers and/or snorkel guides. All definitions below are scored per single occurrence.

Item	Definition
Alive Intentional (AI)	Anytime a snorkeler intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Alive Non-intentional (AN)	Anytime any part of a snorkeler's body or an extension thereof (fins, camera, etc.) comes into contact with living substrate that the individual did not plan or was unaware of.
Dead Intentional (DI)	Anytime a snorkeler intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with non-living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Dead Non-intentional (DN)	Anytime any part of a snorkeler's body or an extension thereof (fins, camera, etc.) comes into contact with non-living substrate that the individual did not plan or was unaware of.
Wildlife Handling (Wildlife)	Anytime a snorkeler handles wildlife. This could be self-initiated or it could be wildlife that has been offered to them by someone else. Examples include handling a starfish, handling a shell with a living organism in it, touching fish, feeding fish.
Sedimentation	Anytime a snorkeler makes a movement with a limb (arm or leg) that results in sediment becoming suspended in the water (creating a dust cloud).
Uncomfortable Standing on Alive Substrate (St Alive unCOM)	The intentional standing on living substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.
Uncomfortable Standing on Dead Substrate (St Dead unCOM)	The intentional standing on dead substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.
Comfortable Standing on Alive Substrate (St Alive COM)	The intentional standing on living substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Comfortable Standing on Dead Substrate (St Dead COM)	The intentional standing on dead substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Standing on Seagrass Comfortable (St SG COM)	The intentional standing on seagrass substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Standing on Seagrass Uncomfortable (St SG unCOM)	The intentional standing on seagrass substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.

Alive Substrate: Any living substrate excluding algal species and plant species. Examples include: sponges, corals, fish.

Dead Substrate: Any non-living substrate including algal species and plant species. Examples include: living rock, macro algae.

Table 4.3. Behavior matrix showing the five actions (defined in Table 4.2) that were used in comparisons between the WITHOUT and the WITH groups (left side of table: alive intentional, dead intentional, standing on seagrass, accidental and wildlife handling), and various behavior categories used in comparisons between the WITHOUT and WITH groups (right side of table).

	Five Actions					Behavior Categories							
Contact	Alive Intentional	Dead Intentional	Standing on Seagrass	Accidental	Wildlife handling	Pos. in General	Pos. for Environ.	Intent. Pos. Beh.	All Intent.	All Non-intent.	Neg. in General	Neg. for Environ.	Intent. Neg. Beh.
AI	✔								✔		✔	✔	✔
AN				✔						✔		✔	
DI		✔				✔	✔	✔	✔				
DN				✔			✔			✔			
Wildlife Handling					✔				✔		✔	✔	
Silt				✔						✔		✔	
St. Alive unCOM	✔									✔		✔	✔
St. Dead unCOM		✔					✔	✔		✔			
St. Alive COM	✔								✔		✔	✔	✔
St. Dead COM		✔				✔	✔	✔	✔				
St. Seagrass COM			✔			✔	✔	✔	✔				
St. Seagrass unCOM			✔				✔	✔		✔			

Pos. in general=positive behavior in general, Pos. for Environ.=positive behavior for the environment, Intent. Pos. Beh.=intentional positive behavior, All Intent.= all intentional behavior, All non-intent.=all non-intentional behavior, Neg. in General=negative behavior in general, Neg. for Environ.=negative behavior for the environment, Intent. Neg. Beh.=intentional negative behavior

4.2.6. Sample Size

Thirty-eight guides were monitored during their snorkel activities before implementation of the interpretation program whilst 34 guides were monitored after implementation of the program. Two hundred and sixty eight participants completed the pre-excursion questionnaire (123 in the WITHOUT interpretation group and 145 in the WITH interpretation group) while 245 participants completed the post-excursion questionnaire (116 in the WITHOUT interpretation group and 129 in the WITH interpretation group). One hundred snorkelers were monitored during snorkel activities in the WITHOUT group and 104 in the WITH group. Complete data sets (i.e. a pre-excursion questionnaire, snorkel monitoring behavior, and a post-excursion questionnaire for one participant) were collected for 204 participants, 100 in the WITHOUT interpretation group and 104 in the WITH interpretation group. There were participants who completed one questionnaire but not the other, or who completed both questionnaires but were not monitored during the snorkeling activity (lacking snorkel behavior data). Occasionally other clients from a different snorkel boat would join an existing excursion half way through the excursion when interpretive efforts were already underway. They would still be asked to complete a post-excursion questionnaire so as not to make them feel left out. Various participants promised to complete the post-excursion in the evening and return it the following day. Unfortunately this did not always happen. Some snorkelers ceased their snorkeling activities before the researcher had a chance to monitor them resulting in pre- and post-questionnaires with no snorkel data. The data collection for the WITHOUT group occurred from January 2011 until June 2011 while the data collection for the WITH group occurred from July 2011 until January 2012. Only the complete data sets were included in the analysis.

4.2.7. Implementation of Interpretation: Guide Training Workshop

A three-day training workshop (see *Appendix 1* for a detailed description of this training workshop) was conducted for all the snorkel operators and associated crew (guides). The training workshop attracted 132 participants from 26 of the 30 active snorkel boats in the Mombasa Marine Park and Reserve and 11 Kenya Wildlife Service staff (the management authority of the park). The workshop focused on methods of implementing interpretation to the snorkel excursions to reduce the environmental impact and enhance clientele satisfaction. The workshop used expert presentations, various discussion groups and role-playing scenarios. One of the major outputs of the workshop was a code of conduct developed by the operators themselves. Upon successful completion of the workshop, each boat was presented with the following materials to use on their future snorkel excursions: flip-chart for presentations, underwater ID slates, branded polo shirts, professional salesman folder, and participant manuals including all the presentations and additional information of the workshop. The workshop targeted the salient beliefs identified by a previous study (*Chapter 3*) through the expert presentations, group discussions and materials presented to each boat.

The teachings of the workshop were presented to the snorkelers through presentations given by the guides of the snorkel boats. The best method of interpretation has often been attributed to guides as they deliver a very personal interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Luck, 2003, Aiello, 1998). Guides tend to act as motivators in getting visitors to respect wildlife or adopt pro-environmental practices (Skanavis and Giannoulis, 2009, Zeppel, 2008, Zeppel and Muloin, 2008, Black and Ham, 2005). Furthermore, attributes such as the ability to demonstrate role-model behavior, manage visitor-wildlife interactions and enforce minimal impact behavior make guides properly and best placed to deliver interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003). Furthermore, Higginbottom (2004) states that guides are very useful in areas where visitors may be contained in a concentrated area (such as the study site). Within this area they can enforce minimal impact behavior and role-model proper behaviors. Guides therefore seem properly and best placed to deliver interpretation. The main messages of the workshop, and the resultant interpretation, were:

- Corals are alive;
- Corals are very fragile and easily damaged;
- Do not stand on or touch corals as you could damage the coral; and,
- If you need to stand, find some sand, seagrass or rubble substrate to stand on.

4.2.8. Statistical Analysis

One-tailed t-tests were used to compare snorkel behavior of the guides before and after the interpretation program was implemented, and also for the snorkelers of the WITHOUT and WITH groups. The t-test was used as it is a robust test regarding the assumption of normality, especially with sample sizes larger than 50. Chi-square tests were used to compare the differences in pre-excursion and post-excursion questionnaires between the WITHOUT and WITH groups for all interval variables while independent samples t-tests were used for continuous variables. Two of the attitude measures in the pre-excursion questionnaire consisted of five responses to bipolar scales (1-7) that were combined into one average score for each of the two questions.

4.3. Results

4.3.1. Snorkel Behavior-Guides

The behavior of 72 guides was monitored during snorkel excursions (38 from the WITHOUT group and 34 from the WITH group). The guides in the WITHOUT group (before the interpretive workshop) had significantly more contacts with the reef substrate in most behaviors and behavior categories (Table 4.4). If the training workshop had no effect on the guides, then no significant differences were expected between the guides of the WITHOUT and WITH group. These differences presented in Table 4.4 indicate that the training workshop and resultant interpretation was effective for the guides in reducing damaging behaviors.

Table 4.4. Average contacts with the reef substrate by guides of the WITHOUT and WITH group for a projected 30-minute period (One-sided independent samples t-test, sample size 72). The table indicates average contacts for different actions and behavior categories as defined in Table 4.3.

	CONTACTS (PER 30 MINUTES)		
Behavior	**WITHOUT Interpretation**	**WITH Interpretation**	**Significance**
Alive Intentional Behavior	6.2	2.0	$p<0.05$
Dead Intentional Behavior	6.2	1.9	$p<0.05$
Wildlife Handling	2.6	1.1	$p<0.05$
Standing on Seagrass	3.2	2.5	$p<0.05$
Positive Snorkel behavior in General	8.6	3.8	$p<0.05$
Negative Snorkel Behavior in General	8.2	2.9	$p<0.05$
Behavior Negative for the Environment	26.5	22.4	$p<0.05$
Intentional Positive Snorkel Behavior	9.4	4.4	$p<0.05$
Intentional Negative Snorkel Behavior	6.2	2.0	$p<0.05$
Accidental Behavior	18.1	20.4	$p>0.05$
Behavior Positive for Environment	9.8	5.6	$p>0.05$

4.3.2. Behavioral Intent and Prior Knowledge

Respondents in both the WITHOUT and WITH groups had strong intentions to not contact the reef substrate. Three measures of behavioral intention were measured and none of these measures differed significantly between the participants of the WITHOUT group and WITH group (chi-squared tests; Table 4.5).

Table 4.5. The intention measures and the respective averages for the WITHOUT and WITH groups (chi-square test, df= 6, n=202; contingency table=7 scale response vs. 2 groups (with/without)).

Intention Measure	Scale	Group	Average score	p-value
I intend to avoid disturbing life on the reef while snorkeling today.	Definitely true (1) to definitely false (7)	WITHOUT	2.2	0.543
		WITH	2.7	
For me to avoid interfering with any life on the reef when I snorkel today is:	Extremely easy (1) to extremely difficult (7)	WITHOUT	1.3	0.738
		WITH	1.5	
I will make an effort to avoid disturbing any life on the reef while snorkeling today.	I definitely will (1) to I definitely will not (7)	WITHOUT	1.6	0.878
		WITH	1.8	

Generally respondents had positive attitudes towards snorkeling and coral reefs. These attitudes towards coral reefs were measured on several different scales (direct and indirect measures). Two of the attitude scales consisted of five bipolar scales. The Cronbach's Alpha coefficients were 0.834 and 0.718 for these two attitude measures (the first two measures listed in Table 4.6) indicating a reliable scale. All attitude measures showed that the WITHOUT and WITH group did not differ significantly (Table 4.6).

Table 4.6. The attitude measures and the respective averages for the WITHOUT and WITH groups (chi-square test, df=6, n=202; contingency table=7 scale response vs. 2 groups (without/with)).

Attitude Measure	Scale	Group	Average score	p-value
*For me to go and snorkel on a coral reef today is:	Average of five responses to bipolar scales (1-7)	WITHOUT	1.9	0.906
		WITH	2.0	
*For me to avoid any disturbance to life on the reef when I snorkel today is:	Average of five responses to bipolar scales (1-7)	WITHOUT	1.4	0.223
		WITH	1.6	
Snorkelers who will visit these reefs in the future should be able to enjoy these reefs.	Strongly agree (1) to strongly disagree (7)	WITHOUT	2.1	0.298
		WITH	1.8	
My getting information and explanations on life in the sea is:	Extremely good (1) to extremely bad (7)	WITHOUT	1.8	0.805
		WITH	1.7	
Fish that live on a reef should be able to seek shelter on that reef.	Definitely true (1) to definitely false (7)	WITHOUT	1.5	0.836
		WITH	1.6	
For me to gain a better understanding of life in the sea is:	Extremely good (1) to extremely bad (7)	WITHOUT	1.4	0.986
		WITH	1.4	
For me to be able to interact with life in the sea is:	Extremely good (1) to extremely bad (7)	WITHOUT	1.9	0.414
		WITH	2.2	
For me to develop good snorkeling skills is:	Extremely good (1) to extremely bad (7)	WITHOUT	2.1	0.310
		WITH	2.5	

**These two attitude measures consisted of five bipolar scales to the attitude statement. The scores to these five scales were averaged. The bipolar scales were 1) harmful/beneficial; 2) pleasant/unpleasant; 3) good/bad; 4) worthless/valuable; and 5) enjoyable/unenjoyable.*

Participants of the WITHOUT and WITH groups were able to describe what the main building blocks of reefs were, various factors that can damage corals, the items that are alive on a reef, if corals are living organisms and the growth rate of corals. However, most participants were not able to answer correctly what best describes corals and where corals get their color from. The only significant difference between the WITHOUT and WITH groups was for the question that asked respondents to state where corals get their color from, however, the average scores for both groups were similar, indicating that the distribution of responses was varied. Participants in both groups were similar in their responses to this question apart from the two of the six options: ‘the sun’ and ‘I don’t know’. These responses had a wide range of answers. More respondents in the WITHOUT group answered the question with the first option (24% vs. 10% for WITHOUT vs. WITH) while more respondents in the WITH group answered the question with the second option (12% vs. 21% for WITHOUT vs. WITH). A total knowledge score was also calculated for every respondent. This total score was based on the answers to each question in the knowledge section of the questionnaire. The overall knowledge score of the participants of the WITHOUT and WITH groups did not differ significantly in the prior knowledge of marine ecosystems they had at the start of the snorkeling excursion. The average total knowledge scores were 62% (WITHOUT) and 60% (WITH) (Table 4.7: independent samples t-test, p=0.22, n=198), indicating that the two groups had similar levels of knowledge about the marine ecosystem prior to any interpretation delivered by the crew.

Table 4.7. The knowledge measures and the respective % scored correctly on each question for the WITHOUT and WITH groups (chi-square test, df=4-8, n=204; contingency table=5-9 responses vs. 2 groups (with/without)).

Knowledge Measure	Scale	Group	% correct	p-value
What best describes the main building blocks of reefs:	Multiple choice (one answer only)	WITHOUT	82	0.446
		WITH	82	
What best describes corals:	Multiple choice (one answer only)	WITHOUT	49	0.169
		WITH	46	
Coral gets its color from:	Multiple choice (multiple answers possible)	WITHOUT	19‡	0.036
		WITH	19‡	
Corals can suffer damage from:	Multiple choice (multiple answers possible)	WITHOUT	99*	0.966
		WITH	99*	
Tick the item(s) that is/are alive on a reef:	Multiple choice (multiple answers possible)	WITHOUT	96*	0.949
		WITH	97*	
Do you believe corals to be living organisms?	Yes / No	WITHOUT	99	0.99
		WITH	99	
Coral growth is best expressed by:	Multiple choice (one answer only)	WITHOUT	74	0.68
		WITH	69	
TOTAL SCORE		**WITHOUT**	**62**	**0.22**
		WITH	**60**	

**These two questions had multiple answers and the percentages shown are those participants that scored one or more of the total correct answers.*

‡Average scores were similar and reasons that could explain the significant difference could be a) wide distribution of answers to this question or b) due to chance.

4.3.3. Snorkel Behavior-Snorkelers

The behavior of 190 snorkelers was monitored during snorkel excursions (91 from the WITHOUT group and 99 from the WITH group; this differs from the total of 204 as snorkelers were monitored in different snorkeling locations and only data from those who frequented Bamburi Coral Garden was used). Average contacts (transformed for a 30 minute period) with the reef substrate appeared to be more pro-environmental for the snorkelers of the WITH group, however, these were not all significant. Significant differences are shown in Table 4.8 (one-tailed, n=190): more contacting dead substrate intentionally by the WITH group as compared to the WITHOUT group, more positive snorkel behavior in general, more snorkel behavior positive for the environment, and more intentional positive snorkel behavior.

Table 4.8. Average contacts with the reef substrate by snorkelers of the WITHOUT and WITH group for a projected 30-minute period (One-sided independent samples t-test, sample size 190).

	CONTACTS (PER 30 MINUTES)		
Behavior	**WITHOUT Interpretation**	**WITH Interpretation**	**Significance**
Dead Intentional Behavior	0.9	2.1	p<0.05
Standing on Seagrass	1.8	2.9	p<0.05
Positive Snorkel behavior in General	1.5	2.4	p<0.05
Behavior Positive for Environment	3.3	6.3	p<0.05
Intentional Positive Snorkel Behavior	2.7	4.8	p<0.05
Alive Intentional Behavior	3.4	2.8	p>0.05
Accidental	17.3	18.6	p>0.05
Wildlife Handling	0.8	0.6	p>0.05
Negative Snorkel Behavior in General	3.8	2.9	p>0.05
Behavior Negative for Environment	20.7	20.6	p>0.05
Intentional Negative Snorkel Behavior	3.4	2.8	p>0.05

4.3.4. Visitor Experience

The post-excursion questionnaire showed that important reasons for participants coming on a snorkeling excursion included learning more about nature and coral reefs. Respondents also rated gaining information on marine life as very important when thinking about marine park attributes (Figure 4.2).

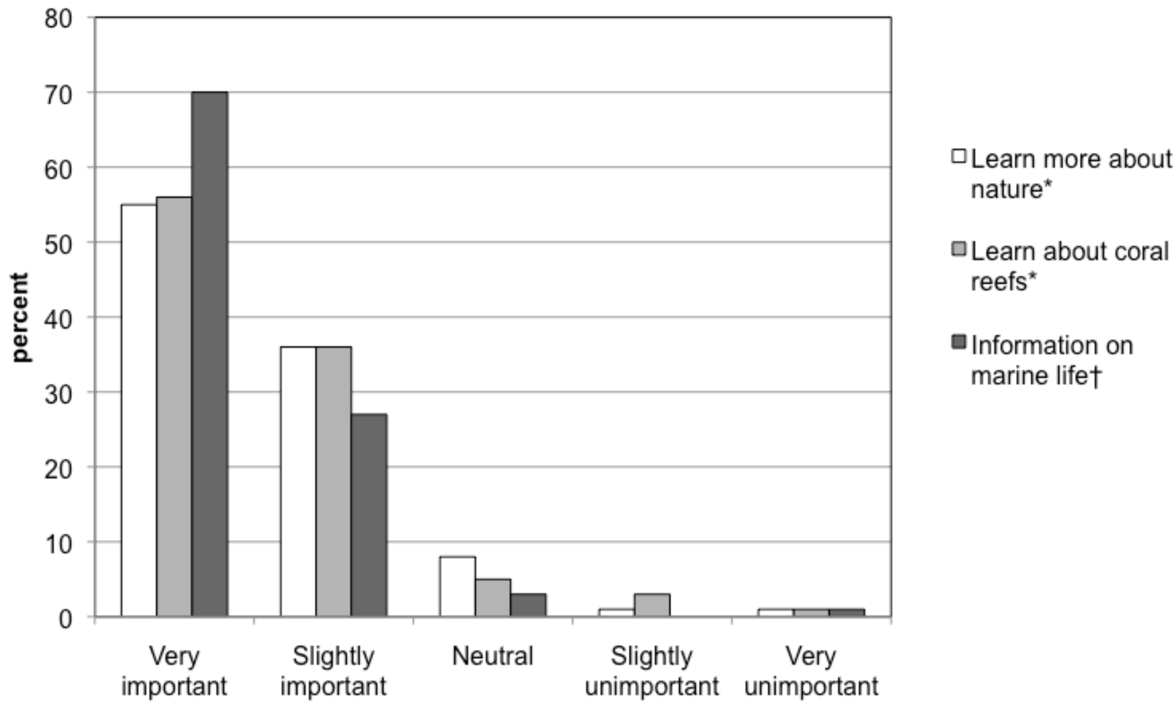


Figure 4.2. The importance participants indicated for learning about nature and coral reefs on snorkeling excursions* and of information on marine life when they visit a marine park† (n=200).

Participants in both the WITHOUT and WITH groups were asked if they received a presentation on the excursion. In the WITHOUT group 34% answered ‘yes’ while in the WITH group 61% answered ‘yes’. This difference is significant (chi-square test, df=1, p=0.00, n=196; contingency table=2 categories of response vs. 2 groups (with/without)). Participants were then asked how satisfied they were with each aspect of the presentation or guided activities. The WITH group was significantly more satisfied with the amount of interaction (chi-square test, df=6, p=0.05, n=190; contingency table=7-scaled response vs. 2 groups (with/without)), use of diagrams, pictures, illustration (chi-square, df=6, p=0.001, n=174; contingency table=7-scaled response vs. 2 groups (with/without)) and how the information was worded or explained (chi-square test, df=6, p=0.001, n=181; 7-scaled response vs. 2 groups (with/without); Figure 4.3). Furthermore participants were asked if information on marine life influenced their enjoyment on their excursion and again a significant result was found showing that participants in the WITH group were more positively influenced (chi-square test, df=4, p=0.017, n=200; contingency table=5-scaled response vs. 2 groups (with/without)).

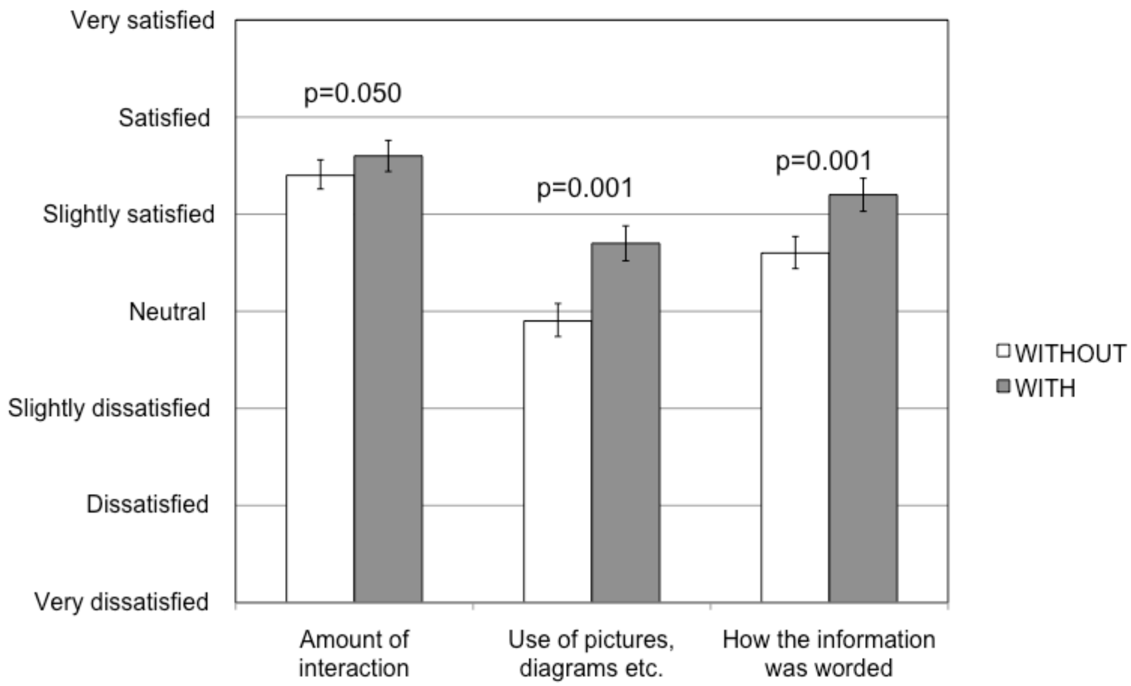


Figure 4.3. Aspects of the guided activities or presentation that participants in the WITHOUT and WITH groups were satisfied or dissatisfied with (n=190). Significant differences between two groups are indicated by the p-value in the figure.

When asked if there were factors that added to their enjoyment, most participants of the WITHOUT and WITH group answered ‘yes’ (no difference between the WITHOUT and WITH group; chi-square test, df=1 p=0.941, n=203; contingency table=yes/no response vs. 2 groups). The reasons the participants gave for their enjoyment differed significantly between the WITHOUT and WITH groups (Table 4.9: chi-square test, df=6, p=0.039, n=180; contingency table=7 categories vs. 2 groups (with/without)). The top two reasons given were enjoying marine life (54% for WITHOUT and 44% for WITH) and the influence of the crew (being friendly, helping, informative, etc.; 15% for both WITHOUT and WITH). However, when the influence of the crew factor is examined more closely (Table 4.10) it shows that in the WITHOUT group only 17% is as a result of the crew member (guide) being informative whereas in the WITH group 36% of the factor is explained by the crew member (guide) being informative.

Table 4.9. The main reasons participants gave as adding to their enjoyment (sample sizes WITHOUT group n= 89, WITH group n=92).

Factor	WITHOUT group (%)	WITH group (%)
Marine life	54	44
Crew Influence	15	15
Snorkeling / Exploring	4	13
50 Reef walk	4	9
Water conditions	7	3
Feeding fish	5	5

Table 4.10. Factors that contributed to the 'crew influence' reason from Table 4.9 (sample sizes WITHOUT group n= 22, WITH group n=20).

Factor	WITHOUT group (%)	WITH group (%)
Informative	17	36
Good company	25	25
Experience	4	0
Assistance	21	17

There was no significant difference between the reasons the WITHOUT and WITH participants provided that contributed negatively to their enjoyment on their excursion (p=0.051, n=203). The main reason provided by the WITH group was that the marine life contributed negatively to their enjoyment while the WITHOUT group stated that crowding (other boats and snorkelers) and fish feeding were the main reasons that contributed negatively.

The amount of elaboration was measured in the post-excursion questionnaire through the use of five questions (Table 4.11). Examining each question individually revealed that the only significant difference between the WITHOUT and WITH group was that in the latter the presentation and/or guided activities made them more curious (chi-square test, df=6, p=0.003, n=190; contingency table=7-scaled response vs. 2 groups (with/without)). However, when the total elaboration score was examined (adding up the individual scores of each question, 35 representing the most amount of elaboration and 5 the least amount) it showed that a significant difference existed: more critical thinking occurred in the WITH group than the WITHOUT group (chi-square test, df=5, p=0.021, n=190; contingency table=6 groups of elaboration vs. 2 groups (with/without)). Most participants in the WITH group were provoked to think more on certain topics of the presentation and/or guided activities during their excursion than their WITHOUT group counterparts (45% of the WITH group scored in the highest elaboration category compared to 27% of the WITHOUT group; Figure 4.4). The amount of elaboration can be used as a gauge for identifying successful interpretation as interpretation aims to stimulate elaboration.

Table 4.11. The five elaboration questions used to gauge the total amount of elaboration during the snorkel excursion. The table also shows how individual questions differed between the WITHOUT interpretation and WITH interpretation groups (independent samples t-test).

Elaboration Questions- Overall, the guided activities and/or presentations I attended today:	Average score WITHOUT group	Sample Size WITHOUT group	Average score WITH group	Sample Size WITH group	p-value
Made me curious/did not make me curious	2.8	90	2.2	100	0.003
Made me think/did not make me think	3.1	87	2.8	99	0.103
Made me want to talk about what I heard/did not make me want to talk about what I heard	2.5	87	2.4	100	0.957
Made me want to know more/did not make me want to know more	2.6	88	2.1	98	0.210
Intrigued me/did not intrigue me	2.6	87	2.2	99	0.193

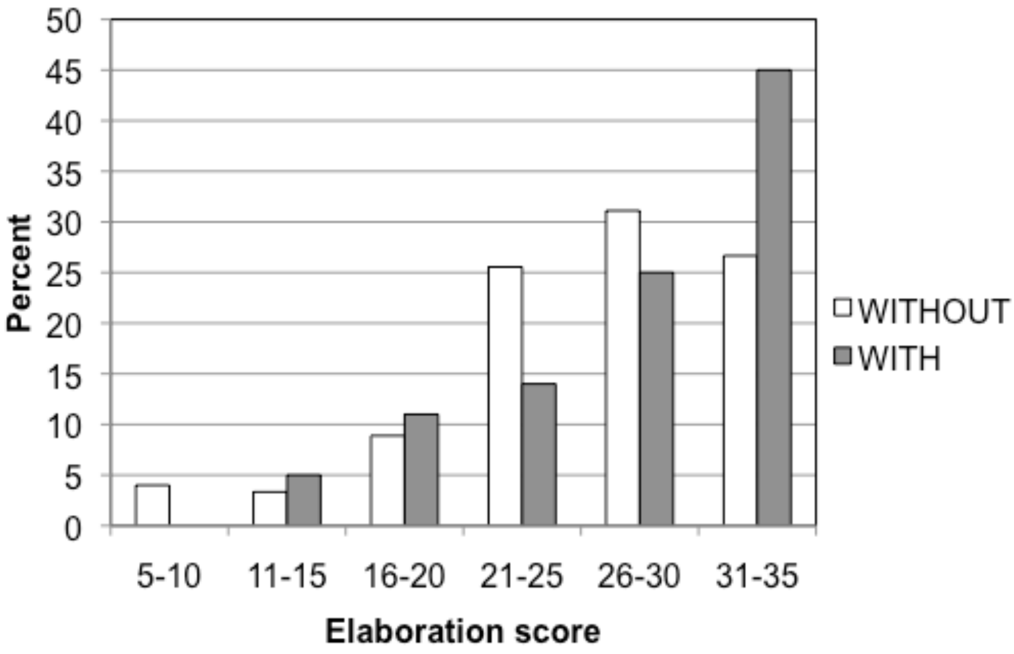


Figure 4.4. The amount of elaboration by the WITHOUT and WITH groups as a result of the guided activities and/or presentation. The columns reflect groupings of the elaboration score with 5-10 being the lowest and 31-35 the highest amount of elaboration (n=190).

Figure 4.5 shows how the enjoyment of the participants was influenced by various factors. Participants in the WITH group were more positively influenced by the helpfulness of the crew (chi-square test, df=4, p=0.025, n=201; contingency table=5-scaled response vs. 2 groups (with/without)), and the appearance of the crew (chi square test; df=4, p=0.004, n=196; contingency table=5-scaled response vs. 2 groups (with/without)). Furthermore, WITH group participants were also more positively influenced by the behavior of other visitors from their boat (chi-square test, df=4, p=0.012, n=196; contingency table=5-scaled response vs. 2 groups (with/without)) and other boats (chi square test, df=4, p=0.005, n=194; contingency table=5-scaled response vs. 2 groups (with/without)).

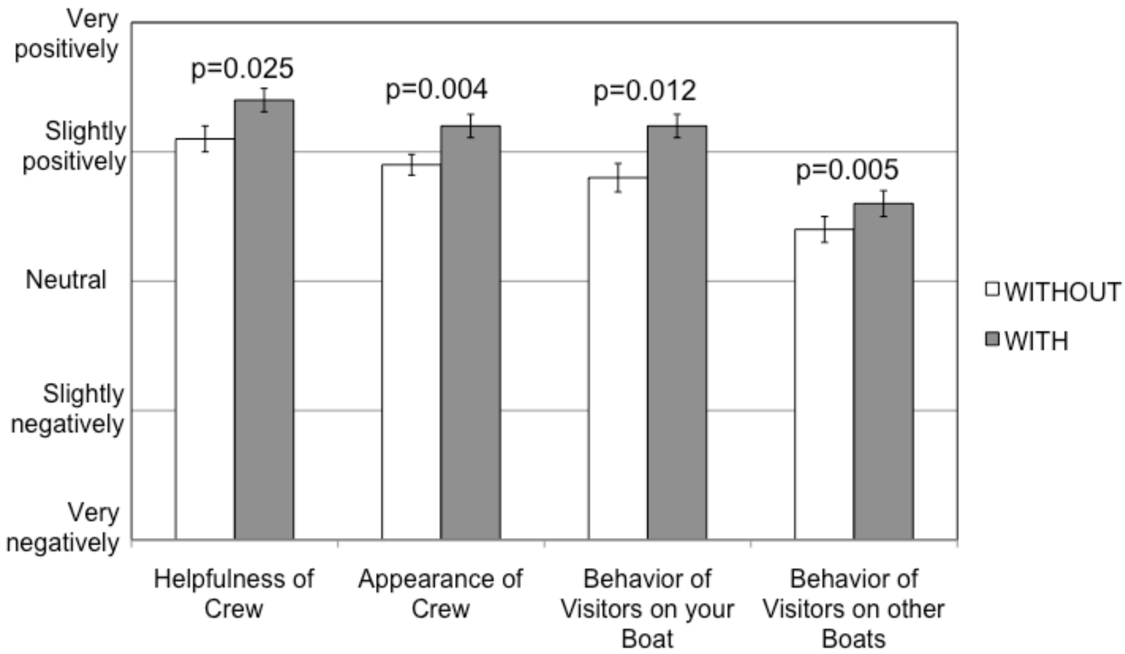


Figure 4.5. Factors that influenced the participants enjoyment in a positive or negative manner for the WITHOUT and WITH groups (n=201). Significant differences between two groups are indicated by the p-value in the figure.

The WITH group rated the overall trip higher than the WITHOUT group participants on a 1-10 scale (independent samples t-test, p=0.043, n=199; average scores were 7.8 and 8.2 (1=poor, 10=excellent) for WITHOUT and WITH respectively). The WITH participants were also more likely to recommend the excursion than the WITHOUT group (chi-square test, df=1, p=0.071, n=197; contingency table=2-scaled response vs. 2 groups (with/without)).

4.3.5. The WITHOUT Interpretation vs. WITH Interpretation Group

Observed differences between participants of the WITHOUT group and the WITH group can be attributed to the test variable (without vs. with interpretation) since no significant differences between WITHOUT and WITH groups were detected on a range of demographic and participation variables. A summary of those variables is shown in *Appendix 5* whilst a more detailed comparison exists in *Appendix 3: Demographics of the snorkelers in the Mombasa marine Park and Reserve*)

4.4. Discussion

Interpretation that incorporates behavior psychology into the design of a program can achieve effective results. However, despite its obvious importance, the incorporation of behavior theory has been lacking in numerous existing interpretation programs (Darnton, 2008, Ham, 2007, Madin and Fenton, 2004, McKenzie-Mohr, 2000, Tanner, 1999, Pastorelli, 1998, Orams, 1997, Ham and Krumpe, 1996, Orams, 1996b, Orams, 1994). The interpretation developed for this study was based on targeting the salient beliefs of snorkelers in the Mombasa Marine Park and Reserve (*Chapter 3*, *Appendix 1*). A training workshop was then developed and presented to the persons involved in the snorkel industry (including the guides, captains, and salesmen) to train them in delivering this interpretation program to their snorkeling clients.

4.4.1. Snorkel Behavior of the Guides

The guides that were monitored before and after implementation of the interpretation program were of the same pool of guides. This is different for the snorkeling participants who were different persons before and after the implementation of the interpretation program. The snorkel guides of the snorkeling excursions exhibited a change in behavior as a result of the interpretative workshop they attended. Results of this research project indicate that the guides had numerous contacts with the reef before the interpretive workshop, and considerably fewer contacts after the workshop. Contacts made by these guides (after implementation of the interpretive efforts) were indiscriminate, as there existed fewer damaging contacts, but also fewer pro-environmental contacts (the guides did not appear to choose how or what they contacted on the reef substrate, they just contacted the reef substrate). This change in behavior (fewer contacts after the workshop) may be an important step in ultimately influencing the behavior of the snorkelers. To further strengthen the influence the guides can have on these resource users, the contact behavior of the guides need to be more discriminate towards non-living substrate. The snorkel behavior of the guides was expected to have changed as a direct effect of having attended the training workshop. However, the snorkel behavior of their snorkeling clients was more determined by the effectiveness of the interpretation delivered by the guides as a result of having attended the workshop.

4.4.2. Snorkel Behavior of the Snorkelers

The measuring of actual participant target behavior (in this case not contacting the reef while snorkeling) is a limitation that many interpretive studies suffer from (*Appendix 2*, Gralton et al. 2004, Zelezny 1999, Howard 1999, Bogner 1998, Finger 1994, Hendee et al. 1990, Hines et al. 1987, Robertson 1986, Chase and Harada 1984, Deutscher 1973, Bickman 1972, Wicker 1971, 1969). This research project was able to measure the actual target behavior and results have indicated that the behavior of those snorkelers who did not receive any interpretation was different from the behavior of snorkelers who did receive interpretation.

One limitation of this research project was that the type and amount of interpretation presented to snorkeling participants was not measured. Interpretive efforts can be delivered through a variety of different methods (e.g. structured presentation, one-to-one conversations, in-water guiding) and the ability to measure these different types of interpretation delivery was beyond the scope of this study. This study examined the differences of snorkelers who were present on snorkel excursions with crewmembers that had received training in delivering an interpretation program (the WITH group) and those crewmembers who had not received this training (WITHOUT group). Snorkelers who did not receive interpretation were similar to those who did receive interpretation regarding their snorkeling experience, attached similar level of importance to the various reasons for partaking in the snorkel excursion, held similar beliefs about marine park attributes in general, and were of similar basic demographics (see *Appendix 3* for a detailed description of the demographics of the snorkelers). Paired with their similar behavioral intentions and attitudes towards not disturbing life on a reef when snorkeling, the only factor that could explain the increase in pro-environmental behavior in the group that received interpretation was the effectiveness of the interpretation program delivered by the guides.

The effectiveness of the interpretive efforts is a result of successful targeting of the salient beliefs driving behavior (*Chapter 3*). Furthermore, the interpretive efforts made effective use of the guides in transferring the teachings of the workshop to the snorkelers through the resultant interpretation program. The main messages conveyed in the interpretive workshop and the resultant interpretation (and interpretive materials) explained that corals were alive and easily damaged by contact. Furthermore, these messages stated that if someone needed to rest or stand up, an area of sand, seagrass or rubble should be located and used as no damage could be inflicted there. The difference in behavior between snorkelers of the group that received interpretation and the group that did not receive interpretation is a result of these interpretive messages. There was no difference in the total number of contacts between both groups, rather a different distribution of the different types of contacts. Snorkelers who received interpretation had significantly more contacts with dead substrate and seagrass substrate than those participants who did not receive any interpretation. These results support the need established by numerous researchers that interpretation based on behavior theory can be effective in conserving resources (Darnton, 2008, Ham, 2007, Madin and Fenton, 2004, McKenzie-Mohr, 2000, Tanner, 1999, Pastorelli, 1998, Orams, 1996b, Orams, 1997, Orams, 1994, Ham and Krumpe, 1996).

4.4.3. Visitor Satisfaction of the Snorkelers

The guides of the snorkel excursion delivered the interpretation to the snorkelers. This method of delivery was chosen for two reasons: studies have shown that guides act as role-models (Littlefair, 2003, Skanavis and Giannoulis, 2009); and the interpretation program was designed to benefit the behavior of snorkel guides (*Chapter 2* indicated that the guides also made numerous contacts with the reef substrate). Guides are often in a unique position to interact with visitors. Higham and Carr (2003) examined 12 ecotourism operations in New Zealand and found that: “the presence of guides and staff was considered by visitors to enhance opportunities for meaningful visitor interpretation, while also ensuring that inappropriate behaviors were managed during the onsite experience” (p. 33). Skanavis (2009) adds to this: “guides have a significant influence over visitors on their tour in terms of minimizing visitor impact on the environment, explaining management strategies and supporting safety messages” (p. 167). Weiler and Ham (2002) furthermore state that guides are required to: “monitor visitor impacts, model appropriate on-site environmental and cultural practices, and deliver minimal impact and conservation messages” (p. 54). However, Ballantyne and Hughes (2001) report: “the potential (for guides) to act as environmental caretakers has yet to be realized” (p. 7). This current study (the thesis) shows that guides can act as environmental caretakers by influencing the behavior of snorkelers and enhancing their visitor experience.

The increase in visitor satisfaction evident in the group who received interpretation is another result of the interpretive efforts of the guides. Participants who received interpretation, and those that did not, were shown to be of similar backgrounds (as outlined above), thus any differences in visitor satisfaction can be attributed to the interpretive efforts. Apart from providing an opportunity to snorkel, visitor satisfaction is another output of an effective interpretation program and results have supported the realization of this output. In this study the transfer of information appears to be the driving reason for the increased visitor satisfaction. The participants who received interpretation and those that did not had a similar level of prior knowledge of marine ecosystems at the start of the excursion and they both attached a similar value of importance to receiving information on marine life. The desire of recreational resource users to learn has been illustrated in other studies (Zeppel, 2008, Packer, 2006, Luck, 2003). However, more participants who received interpretation stated that they received a presentation and that they were also more satisfied with certain aspects of that presentation. Furthermore, these same participants indicated that ‘information on marine life’ influenced their enjoyment more positively than those participants that did not receive any interpretation. Thus, information was flowing to the participants through the guide of the snorkel boat. Increasing visitor satisfaction was one of the main goals of the interpretive program as increased satisfaction will make people more receptive to interpretive efforts and increase acceptance of the program by snorkel guides and their clientele (Moscardo et al., 2004). One must remember that: “people who enjoy an interpretive program are usually more likely to learn from it and to change their attitudes and behaviors” (Moscardo et al. 2004, p. 234). This means that a well-designed interpretation program will benefit the clients, the guides and the environment.

Results of this study indicate that snorkelers of the interpretation group were more satisfied with the knowledge of the guide, another important characteristic of a successful guide and effective interpretation program. Mayes and Richin (2008) described similar results studying dolphin watching tourism in Australia. They found that participants attributed a high level of importance to guides being knowledgeable. Almagor (1985) studied guides on a wildlife reserve in Botswana and found that participants’ greatest dissatisfaction stemmed from the lack of knowledge a guide has. Eagles et al. (2002) stated that tourists expect guides to be knowledgeable, a characteristic mirrored by Higham and Carr (2003). Weiler and Davis’ (1993) study on investigating the role of guides revealed that 92% of visitors interviewed stated that knowledge was a requirement for guides to have. But it is not just visitors who believe guides should be knowledgeable. Ballantyne and Hughes (2001) conducted a study on ecotour guides in Australia to determine the perceptions of their (the guide) role and responsibilities. They found that the guides: “regard the provision of information and awareness of one’s audience as paramount” (p. 2).

The increased knowledge that the guides of this current study exhibited could also account for the increased levels of elaboration, or critical thinking, in those snorkelers who had received interpretive efforts. This high degree of elaboration may also have created lasting connections between the topics provided in the interpretation and the resultant pro-environmental behavior (Wearing et al., 2008, Ham and Weiler, 2005). Connections may also be made with, or strengthened by, an individual’s existing knowledge or past behavior as a result of elaboration (Moscardo et al., 2004). Past research has shown that visitors that have been informed about appropriate behavior are more likely to exhibit this behavior (Moscardo et al., 2004, Moscardo, 1999, Ballantyne et al., 1998) and these lasting connections only strengthen that. The data collected in this study did not enable the researcher to determine whether the elaboration measured a result of the interpretation program as a whole, or a specific interpretation component or message. Future studies will be needed to determine exactly which messages created the increase in elaboration in the group that received interpretation.

Elaboration of a message is an essential step in influencing behavior (Petty et al., 1992, Breckler et al., 2006, Ajzen, 1992). Elaboration was measured using five, 7-scaled, pre-set and pre-tested questions (Ham and Weiler, 2005, Wearing et al., 2008) to determine the amount of message processing by the participants throughout their excursion. The TORE^{TM} method of applying interpretation was used in the design of the interpretive efforts to enhance the amount of elaboration, as suggested by various authors (Anonymous, 2012, Ham et al., 2009, Powell and Ham, 2008, Wearing et al., 2008, Ham, 2003, O'Brien, 2000, Ham, 1992). Participants in the group that received interpretation were stimulated to think more critically (elaboration) about the information that was presented to them, which could have provoked more pro-environmental behavior. The critical thinking exhibited by the snorkelers of the group that had received interpretive efforts suggests that the TORE^{TM} method of designing interpretation was effectively used in the application of the interpretive efforts by the guides.

Remaining findings reveal that the interpretation program was also successful in enhancing visitor's enjoyment on several other factors. These factors include: helpfulness of crew, appearance of crew and behavior of visitors. This is another direct result of the training workshop for the snorkel operators and associated crew. The training workshop did not focus only on interpretation but also covered areas of snorkel guiding, hospitality, sales, professionalism and conservation. Items such as the helpfulness of the crew and the appearance of the crew could be categorized as professionalism. The interpretation program could also explain how the behavior of other visitors on the same boat as the participants, and those on other boats, positively influenced their enjoyment as it could have maintained the attention span and focus of the visitors for the duration of the excursion, thereby preventing any dominant or inappropriate behavior from emerging. The overall evaluation score for the snorkel excursion was also significantly different (with the interpretation group scoring higher) illustrating that the interpretation could indeed be labeled effective.

4.5. Conclusion

This study was based on behavior theory and consequently targeted those important beliefs that dictated behavior through an interpretation program delivered by guides. Many studies have indicated that interpretation programs must be based on behavior theory as this will assist in identifying what needs to be targeted when attempting to influence behavior (Orams, 1996b, Orams, 1997, Tanner, 1999, Darnton, 2008). Research has indicated that to influence the behavior of people, interpretation programs must target the salient beliefs people have towards a specific behavior (Ajzen, 1988, Ham et al., 2009, Ballantyne and Packer, 2005). Without identifying these salient beliefs, or the beliefs that drive a particular behavior, any efforts at influencing that behavior is nothing more than a guess.

The training workshop covered how to best convey facts and information to the audience and also included ways of interacting with the audience. The workshop then put these practices into action by going through some role-play scenarios that focused on transferring information from the guide to the client. The guides were successful in transferring the teachings of the interpretive program to the clients, resulting in clientele experience and behavior having been influenced. Other research has confirmed that the use of guides is the most effective method of conveying interpretive messages (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003). Results of this study indicate that the behavior of the guides can be influenced and that interpretation delivered through the guides can alter the behavior of their clients (the snorkelers) and enhance the experience of their clients. Studies have revealed how guides can be instrumental in influencing the behavior of their clients as they are considered role-models and certain behavior is expected of them (Littlefair, 2003, Moscardo et al., 2004, Skanavis and Giannoulis, 2009). However, these studies do not research the similarities of guide-client behavior. The findings of this study can be used to convince snorkel operators to adopt interpretive efforts as it safeguards the marine resources on which their livelihoods depend.

Even though the behavior of the snorkel guides after the implementation of the interpretation program consisted of indiscriminate contacts, there were fewer contacts. This behavior change is a first step in applying role-model behavior to influence the behavior of snorkelers. The current interpretation program was effective in reducing negative snorkel behavior by the snorkelers and enhancing their visitor experience. Studies have shown that visitors believe their guides to be role-models of various behaviors that are acceptable and permissible within a protected area (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003). Visitors hold guides in high esteem as these resource users indicated that guides were the most important group of people that approved of them (the snorkelers) not contacting the reef substrate while snorkeling, and that guides were the ones most likely not to make contact with the reef substrate while snorkeling (*Chapter 3*). Therefore, since the behavior of the guides changed as a result of the interpretive workshop, the behavior of their clients (the snorkelers) followed suit. However, since the guides contacted the reef substrate in an indiscriminate manner, and the snorkelers exhibited fewer negative contacts, it is possible that the guide's role-model behavior might only account for a portion of the explanation as to why the snorkelers who received interpretation exhibited more pro-environmental behavior. The increased pro-environmental behavior of the participants that received interpretation is most likely a joined result of the interpretation program and the behavior of the snorkel guides (which in turn is a direct effect of the training workshop they attended).

In conclusion, this study demonstrated that a properly designed interpretation program, that is based on behavior psychology and targets the salient beliefs, can be effective in influencing the snorkel behavior of guides and their snorkeling clients. Furthermore, results demonstrated that interpretive efforts can also create an enhanced visitor experience through the transfer of information. The next chapter will identify which route of ELM the snorkelers used: the long-lasting central route, or the short-lasting peripheral route to persuasion.

Chapter 5: Long-term Behavior Belief Changes of Snorkelers as a Result of Interpretation in the Mombasa Marine Park and Reserve, Kenya

5.1. Introduction

Interpretive efforts can influence the behavior of a resource user into more pro-environmental behavior. The immediate behavior change can result in resource protection and if the behavior change is long-lasting then the preservation of these resources is strengthened. The previous chapter examined how an interpretation program, delivered by snorkel guides, in the Mombasa Marine Park and Reserve, Kenya, resulted in behavior change of the guides and snorkelers. This interpretation program ensured a repetitive and long (multiple interactions throughout the 3-4 hour excursion) exposure time with the visitors (snorkelers). Data were collected for two groups of resource users. One group was not exposed to any structured interpretive efforts by the crew, while the crew of the other group attended a training workshop (*Chapter 4*, *Appendix 1*) that allowed them to implement an interpretive program on all future snorkel excursions. Results of this research indicated that snorkel behavior of visitors exposed to interpretive efforts by guides was more pro-environmental (less damaging) and in line with the main messages advocated by the interpretation, than the behavior of those not exposed to interpretation. Furthermore, visitors exposed to the interpretive efforts by guides were generally more satisfied by the excursion as a whole and by how the amount of information coming from the guides influenced their excursion more positively. To summarize, snorkel behavior was influenced on a short-term basis. Long-term belief changes will be largely determined by the amount of elaboration, or critical thinking, induced by interpretive efforts. The previous chapter only examined the short-term behavior change whereas the aim of this chapter is to determine whether the interpretation program resulted in long-term changes in snorkeler's beliefs.

5.1.1. Theoretical Framework

Interpretation

Interpretation has been shown to reduce the immediate negative impacts by visitors on resources by influencing the behavior of visitors during resource use. Interpretive efforts can also reduce any future impacts visitors could make (Mayes et al., 2004, Mayes and Richins, 2008, Zeppel, 2008, Zeppel and Muloin, 2008, Weiler and Ham, 2001, Armstrong and Weiler, 2002). Interpretation can influence not only the behavior but also the underlying beliefs responsible for that behavior. In terms of resource use this has the potential to create more pro-environmental behavior for the long term, resulting in long-term benefits to the environment (Mayes and Richins, 2008) on a wider geographic area.

Achieving desired results through the use of interpretation is challenging. Factors that make interpretation challenging include the often short exposure time interpretive efforts have with visitors, and the non-repetitive interaction interpretive efforts have with visitors (Ham, 2007, Orams, 1994, Beaumont, 1998). Determining if interpretive efforts resulted in long-term belief and behavior change is crucial for conservation to be effective in a wider geographical area. Long-term is defined as a point in time after the immediate interpretation was delivered (post-excursion) whilst short-term is defined as immediately following the interpretation efforts (during and throughout excursion). However, determining if behavior change was long-lasting or rather just a short-term effect can be difficult, as follow-up studies are time-consuming, expensive and difficult with transient recreational resource users such as visiting tourists (Forestell, 1993). As a result, there is a need for more research examining long-term effects of interpretation (Mayes and Richins, 2008, Zeppel, 2008, Zeppel and Muloin, 2008, Dresner and Gill, 1994).

One method that can be used to overcome this obstacle is to measure behavior beliefs. Behavior beliefs can influence behavior (Ajzen and Fishbein, 1980), especially the salient beliefs towards a specific activity (Ham et al., 2009). Knowing what the underlying beliefs of behavior are could be an indicator of the expected behavior. This study examines if an interpretation program delivered to (mostly) transient recreational resource users created long-term underlying belief changes of the visitors regarding the behavior of not contacting the reef substrate when they snorkel. This research project used data gathered from a web questionnaire that was emailed to all participants six to 14 months following the snorkel excursion to be able to compare how beliefs changed over time. The next section explains how the Elaboration Likelihood Model is used to determine if behavioral belief change was of long-term duration.

Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM) has two possible routes to persuasion: the long-lasting central route to persuasion and the short-lasting peripheral route to persuasion (see *section 1.2.3 of the Literature Review*, Manfredo and Bright 1991, Breckler, Olson et al. 2006). The main difference between these two routes is the amount of elaboration that occurred:

increased elaboration results in the central route to persuasion whilst decreased elaboration the peripheral route. In the TORE™ (Thematic, Organized, Relevant and Enjoyable) model this is illustrated by the full route in the diagram of the model (see *section 1.2.3 of the Literature Review*), or the shortcut route in the diagram of the model. Behavior change as a result of the central route to persuasion is based on belief-relevant reasons changing the underlying salient beliefs. When the peripheral route is activated these salient beliefs are not changed and the resultant behavior change will only be short-lasting (Marion and Reid, 2007, Breckler et al., 2006, Ajzen, 1992). The determining factor between these two routes is the amount of elaboration, or critical thinking that occurs by the audience as a result of the interpretation (Breckler et al., 2006, Ajzen, 1992, Petty et al., 1992). Factors that influence elaboration include: prior knowledge; direct experience; topic involvement; need for cognition; status in social group; and source credibility (Manfredo and Bright, 1991). Either one of these, or several of these factors could be involved in the amount of elaboration an individual has. One possible example could be snorkelers who have an extensive knowledge of marine life, go out snorkeling and believe their interpretive guide to be credible, may have more elaboration compared to those snorkelers who know very little of the marine ecosystem and do not believe their guide to be credible. More research will be needed to confirm this hypothesis. Thus, the processes used to invoke elaboration as a result of interpretive efforts will dictate the amount of elaboration, and therefore can determine whether long-term belief changes have occurred.

The interpretive efforts delivered by snorkel guides described in a previous study (*Chapter 4*) indicated that behavior was influenced immediately after the interpretive efforts (during the excursion). This study examines if the message content and strength of the interpretive efforts were sufficient to result in long-term belief changes. Determining if the current interpretive efforts result in long-term changes of belief measures will achieve two goals: 1) help predict long-term behavior change and 2) guide current interpretation to make it more effective for the conservation of recreational marine resources globally.

5.1.2. Aims of this Study

This chapter builds on previous research to determine if targeting salient beliefs through interpretive efforts in the Mombasa Marine Park and Reserve can result in long-term changes of belief measures. The research question is:

> Does interpretation create long-term behavioral (salient) belief changes? And if so, which beliefs are most susceptible to change?

5.2. Methods

5.2.1. Overview of Methods

This chapter extends the results of the previous chapter by following up with respondents six to 14 months later. The methods consisted of gathering questionnaire data of snorkelers during their snorkel activities and six to 14 months after their snorkel activity. These methods are discussed in more detail below.

5.2.2. The Research Design

The research involved gathering data regarding a snorkeler's behavioral intent immediately prior to a snorkeling excursion and again six to 14 months after the snorkeling excursion. At the start of a snorkeling excursion a visitor was asked to complete a pre-excursion questionnaire. This questionnaire contained questions about the snorkeler's behavioral beliefs, normative beliefs, control beliefs, behavioral intent and prior knowledge (described in *Chapter 4*). This questionnaire was completed before any interaction occurred with the crew and the marine resources. Upon completion of the questionnaire the snorkel excursion was conducted as normal. Following the snorkel excursion a post-excursion questionnaire was administered that contained questions about the participant's experience and general demographic questions. Data collected in this manner were labeled as the WITHOUT interpretation group. When sufficient data had been collected a training workshop was conducted for the snorkel boat operators and crew. This workshop aimed to introduce interpretive practices into the snorkeling excursion (*Appendix 1*). Following the workshop and implementation of the teachings of the workshop, sampling was repeated following the same methods until a similar sample size was collected. This data group was labeled the WITH interpretation group. All participants were chosen by approaching the first boat with clients from the busiest departure point in the park. If the clients refused, or said they would not snorkel, the next boat was approached. Figure 5.1 depicts the research design and indicates the data gathered during each stage of the snorkel excursion. The web questionnaire collected similar information to the pre-excursion questionnaire.

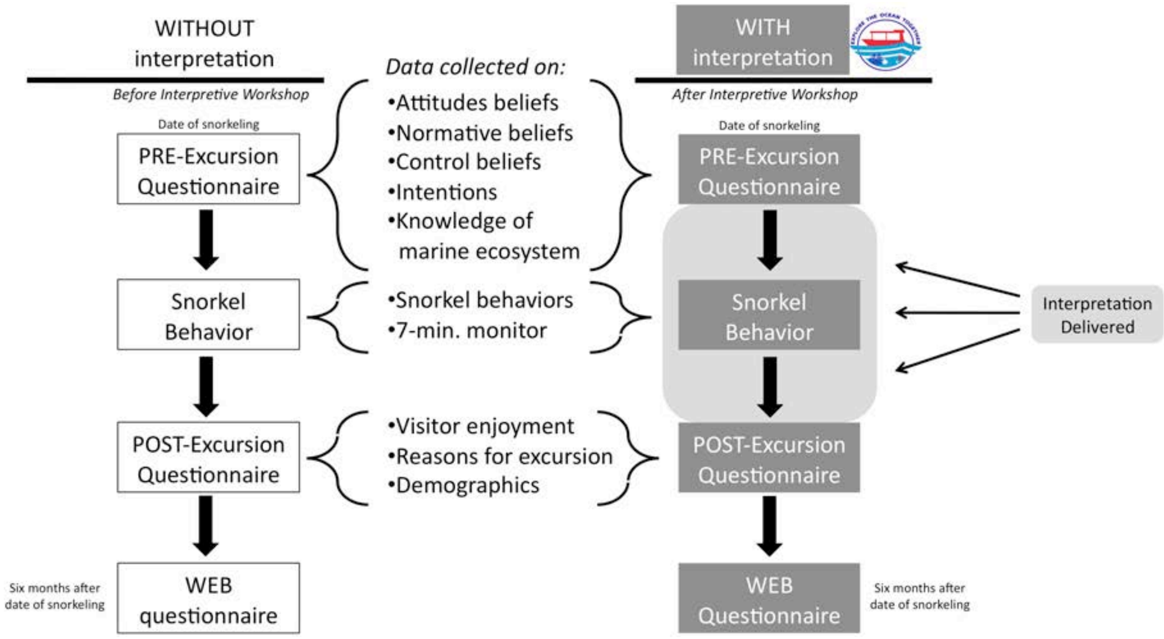


Figure 5.1. The overall research design indicating the WITHOUT interpretation group and the WITH interpretation group. The 'WEB questionnaire' was sent to the participants six to 14 months after their date of snorkeling. The results of the snorkel behavior and visitor experience are described in *Chapter 4*.

The post-excursion questionnaire asked participants to list their email address (see below for response rate). Six to 14 months after participants completed their snorkel excursion they were emailed a link to an online web questionnaire (web questionnaire box in Figure 5.1). This questionnaire contained questions about the participant's behavioral beliefs, control beliefs and behavioral intent. These questions were the same questions used in the pre-excursion questionnaire and consisted of four behavioral belief measures, three intention measures and five control belief measures. This questionnaire then provided paired data from both questionnaires. Participants were invited to take the web questionnaire in the same language as the original pre-excursion questionnaire. Participants were emailed with follow up emails to encourage response one week, three weeks and four weeks after the original invitation to the web questionnaire. The final reminder coincided with a week before the deadline of the web questionnaire.

If long-term behavior belief changes occurred then it is expected that the participants of the WITH group will have more positive beliefs in the web questionnaire compared to the original pre-excursion questionnaire. Furthermore, no difference is expected between the results of both surveys for the WITHOUT group. However, if the behavior belief change was short-term, no differences in the WITH and WITHOUT group are expected between the two questionnaires.

5.2.3. Questionnaire Design

Both the pre-excursion questionnaire and the online web questionnaire were designed to obtain a participant's behavioral beliefs, control beliefs and behavioral intention. These questions were Likert-scaled, bi-polar statements on a 7-point scale and derived from past studies (Fishbein and Ajzen, 2010, Francis et al., 2004). Question wording is presented in Table 5.2. The questionnaire was pre-tested for clarity and comprehension, by 89 participants and any questions/wording that were ambiguous or unclear were modified or discarded. The questionnaires were available in English, French and German. The French and German translations were translated into the respective languages by one native speaker and then translated back into English by another native speaker. Any discrepancies were discussed and clarified. The complete web questionnaire used is shown in *Appendix 4*.

5.2.4. Sample Size

The initial questionnaire was administered to a sample of 268 snorkelers. Approximately half the participants in both the WITHOUT and WITH groups provided email addresses which were used to administer the follow-up web survey. Slightly more participants from the WITH group replied to the follow-up questionnaire compared to the WITHOUT group. The web questionnaire had an overall response rate of 57% (Table 5.1).

Table 5.1. The total number of participants in the WITHOUT and WITH groups indicating those that provided an email address and those that replied to the web questionnaire.

Group	Total Participants	Participants with email addresses	Participants that responded	Response rate
WITHOUT	123	64	34	53%
WITH	145	87	52	60%
Total	268	151	86	57%

5.2.5. Statistical Analysis

The difference between the respondent's initial score and their web questionnaire score were calculated for each question. Independent samples t-tests were used in The Statistical Package for Social Sciences (SPSS) to test whether the average difference was statistically significant for the WITHOUT interpretation group and the WITH interpretation group. A significance level of 0.05 was used for all statistical tests. Some of the questions scored on a seven-point scale were collapsed into either a three-point and five-point scale for analysis purposes (indicated in text when this was applied).

5.3. Results

Table 5.2 shows the results of the participant's difference in scores of the original pre-excursion questionnaire response minus the web questionnaire response (scores depicted are from a 7-point scale, 1= positive side of the scale and 7=negative side of the scale). Eleven of the 12 belief measures showed no significant difference between the WITHOUT and WITH groups (independent samples t-test, sample size = 86). The one measure that did show a significant difference was a control measure indicating how easy/difficult participants felt it was to be able to control how they snorkel. For that variable, the difference between the pre-excursion and web questionnaires was positive (0.56) for the WITH group, but negative for the WITHOUT group (-0.32), indicating that the WITH group has more of a positive belief regarding this measure in the web survey (Table 5.2). Furthermore, the WITHOUT group's responses in the original questionnaire differed compared to the WITH group's responses (chi-square test, df=6, p=0.083, sample size = 85; contingency table=7-scaled responses vs. 2 groups (with/without)) indicating that the WITHOUT group felt more positively in control than the WITH group. The responses of both groups did not differ in the web questionnaire (chi-square test, df=6, p=0.542, sample size = 83; contingency table=7-scaled responses vs. 2 groups (with/without)). This implies that the participants of the WITH group have gained a certain amount of control when they snorkel as a result of the interpretive efforts equating them to the participants of the WITHOUT group.

Table 5.2. The differences of the responses of the WITHOUT and WITH groups. The differences are derived from subtracting the web questionnaire response from the original questionnaire response (scores depicted are from a 7-point scale, 1= positive side of the scale and 7=negative side of the scale; independent samples t-test of the differences, n=86).

Measure	Type of Measure	Group	Original	Web	Average differences	p-value
For me to gain a better understanding of life in the sea is ___________. (extremely good-extremely bad)	Behavioral Belief	WITHOUT	2.2	2.1	0.09	0.135
		WITH	2.7	2.1	0.59	
For me to develop good snorkeling skills is __________. (extremely good-extremely bad)	Behavioral Belief	WITHOUT	1.3	2.8	-1.47	0.848
		WITH	1.5	2.9	-1.41	
My getting information and explanations on life in the sea is ___________. (extremely good-extremely bad)	Behavioral Belief	WITHOUT	1.6	2.1	-0.44	0.901
		WITH	1.8	2.2	-0.41	
Snorkelers who will visit reefs in the future should be able to enjoy the reefs. (strongly agree-strongly disagree)	Behavioral Belief	WITHOUT	2.2	1.8	0.41	0.550
		WITH	2.0	1.9	0.10	
If I think of my swimming abilities when I snorkel, I believe I have ___________ in my swimming abilities. (complete confidence-no confidence)	Control Belief	WITHOUT	2.5	2.7	-0.21	0.313
		WITH	2.3	2.8	-0.49	
If I think about my abilities in using snorkel equipment when I snorkel, I believe that I have ______ in using the snorkel equipment. (complete confidence-no confidence)	Control Belief	WITHOUT	2.7	3.2	-0.59	0.175
		WITH	2.8	3.0	-0.14	
It is mostly up to me whether I disturb life on a reef when I snorkel. (strongly agree-strongly disagree)	Control Belief	WITHOUT	2.2	2.9	-0.79	0.448
		WITH	3.0	3.3	-0.35	
I believe my ability to control how I will snorkel during future snorkel trips will be _______. (extremely easy-very difficult)	Control Belief	WITHOUT	2.6	2.9	-0.32	0.019
		WITH	3.4	2.8	0.56	
If I wanted to I could not disturb any life on the reef when I snorkel. (definitely true-definitely false)	Control Belief	WITHOUT	2.6	2.2	0.41	0.861
		WITH	3.5	3.0	0.49	
I will make an effort to avoid disturbing any life on a reef while snorkeling. (strongly agree-strongly disagree)	Intention measure	WITHOUT	1.2	1.5	-0.32	0.550
		WITH	1.4	1.5	-0.12	
For me to avoid interfering with any life on the reef when I snorkel in the future is _____. (extremely easy-very difficult)	Intention measure	WITHOUT	3.1	2.8	0.30	0.990
		WITH	3.5	3.3	0.30	
When I snorkel I intend to avoid disturbing life on the reef. (definitely true-definitely false)	Intention measure	WITHOUT	1.2	1.3	-0.09	0.183
		WITH	1.4	1.2	0.18	

5.4. Discussion

This research project is a continuation of previous research that used the Theory of Planned Behavior as a framework to discover what salient beliefs were driving snorkeling behavior. Guides then targeted these salient beliefs with interpretive efforts, resulting in immediate changed snorkel behavior of snorkelers as they exhibited more pro-environmental behavior. That these beliefs were not altered long-term can be attributed to insufficient elaboration (Ham, 2007, Manfredo and Bright, 1991, Petty and Cacioppo, 1986). Other studies that have examined long-term changes have focused on behavior intent gathered from self-report data, due to the difficulties of direct observation at a future date (Marion and Reid, 2007). Howard (1999) conducted a study at Mon Repos Conservation Park, Australia and found that visitors who were surveyed directly prior to their visit and six months after their visit stated that they would complete, or had completed, various conservation behaviors (such as spreading the word, removing litter, teaching people, becoming a volunteer). Orams (1998) obtained similar results during a study at Tangalooma, Australia examining the effectiveness of an education program. Results of Orams' study included fewer deliberate touching of dolphins following an interpretation program that consisted of a visit to the education center and attendance of a feeding briefing. Zeppel (2008, 2008) completed analyses of marine wildlife experiences and research on guided tourist encounters, and found that various authors found similar long-term conservation behavior as a result of the interpretive programs participants attended. Although these studies focused more on conservation behavior in general rather than a specific activity, it indicates interpretation can meet with success when it comes to influencing behavioral beliefs. It must be remembered that self-reporting of behavior, and behavior intent, do not always accurately portray actual behavior (*Appendix 2*) and these are limitations of the afore mentioned studies, and this study as well.

This study investigated whether interpretation during snorkel trips resulted in long-term belief change for snorkelers to the Mombasa Marine Park and Reserve. Results indicate that only one belief was altered for a long-term duration. This long-term changed belief was a control belief. However, caution must be exercised when interpreting this as a long-term belief change. Responses to the pre-excursion questionnaire indicated that participants of the no-interpretation group reported feeling more in control to those participants who had received interpretation. This questionnaire was administered right before the snorkeling excursion. The same comparison of the web questionnaire responses for the two different groups yielded no significant difference. Thus, the interpretation provided participants of the interpretation group with additional control, equating them to the participants of the no-interpretation group.

The remaining 11 beliefs measured showed no significant differences between the responses of those participants who did not receive any interpretation and those who did. This indicates that no long-term belief changes were present as a result of the interpretation. Previous research (as described in *Chapter 4*) showed that actual behavior was different between the group that received no interpretation and the group that did receive interpretation as a result of the interpretive efforts. If this behavior change was a result of the central route to persuasion then the underlying beliefs could have been altered. Since the underlying beliefs (behavioral, control and intentions) were not significantly different between the two groups it is concluded that the participants used the peripheral route to persuasion (Marion and Reid, 2007, Manfredo and Bright, 1991). The short-term behavior change from the previous study reveals that persuasion communication can be effective when behavior and attitude change theory is adopted (Manfredo and Bright, 1991). However, messages that are based on salient beliefs (Ballantyne and Packer, 2005, Ballantyne et al., 1998, Ham and Krumpe, 1996) might not always lead to long-term belief changes as indicated in this study and previous research (*Chapter 4*). More research is needed to better understand how to use interpretation to achieve long-term behavior change.

Forestell (1990) concludes that by looking at the cognitive psychology aspect of behavior it must be realized that any new information acquired by a recreational resource user can be incorporated into their “behavioral repertoire” and that “this can occur almost instantaneously, but more often it takes weeks or months, or even years” (p. 37). Forestell (1990) concludes that brief encounters will most likely not lead to (long-term) behavior changes.

5.5. Conclusion

In conclusion, the data appear to show that long-term belief changes have not taken place. The note of importance for the local stakeholders though is that even if beliefs were not altered for the long-term, immediate behavior change did occur as a result of the interpretive efforts and therefore the local resources were protected. The interpretation would have been more effective if long-term belief changes were evident, as resources could have been protected globally. It could be the case that the interpretive efforts used in the Mombasa Marine Park and Reserve were too short for the underlying beliefs (and subsequent behavior) to have been altered (Beaumont, 1998, Orams, 1994, Bogner, 1998, Stern, 1999), as Ham (2007) summarizes: "many interpretive encounters are simply too short-lived for lasting attitudes impacts to occur readily" (p. 44).

This research study has not been able to validate the hypothesis that the interpretation described in *Chapter 4* resulted in long-term belief and behavior changes. More research is needed on this topic to contribute to the design and delivery of interpretive efforts to ensure that long-term changes occur. Future researchers must consult the literature and utilize information gathered from lessons learnt, challenges overcome and mistakes made. An evaluation program should be incorporated into interpretation programs so that interpretive efforts can be assured of meeting targets and goals, is as efficient as possible and has the ability to self-rectify any problems/issues that arise (Ham and Weiler, 2006).

Chapter 6: Final Conclusion

6.1. Introduction

This research project investigated how the theoretical framework (Figure 6.1) could be used to understand and influence the behavior of scuba divers and snorkelers in the Mombasa Marine Park and Reserve to protect marine resources. The first step in this research project involved determining the potentially damaging behavior of the scuba divers and snorkelers, and identifying the factors that influenced this behavior. The salient beliefs of not contacting the coral reef of scuba divers and snorkelers were then identified. Understanding the factors that influence behavior, paired with the salient beliefs about not contacting the coral reef, allowed recommendations to be made for the design of interpretive efforts. An interpretation program for the snorkelers was then created and the effectiveness of those efforts was then researched to determine if the aim of the research project had been met**.** This final chapter will present an overview of the implications of the research, implications for management, methodological limitations of the project, and recommendations for future research priorities.

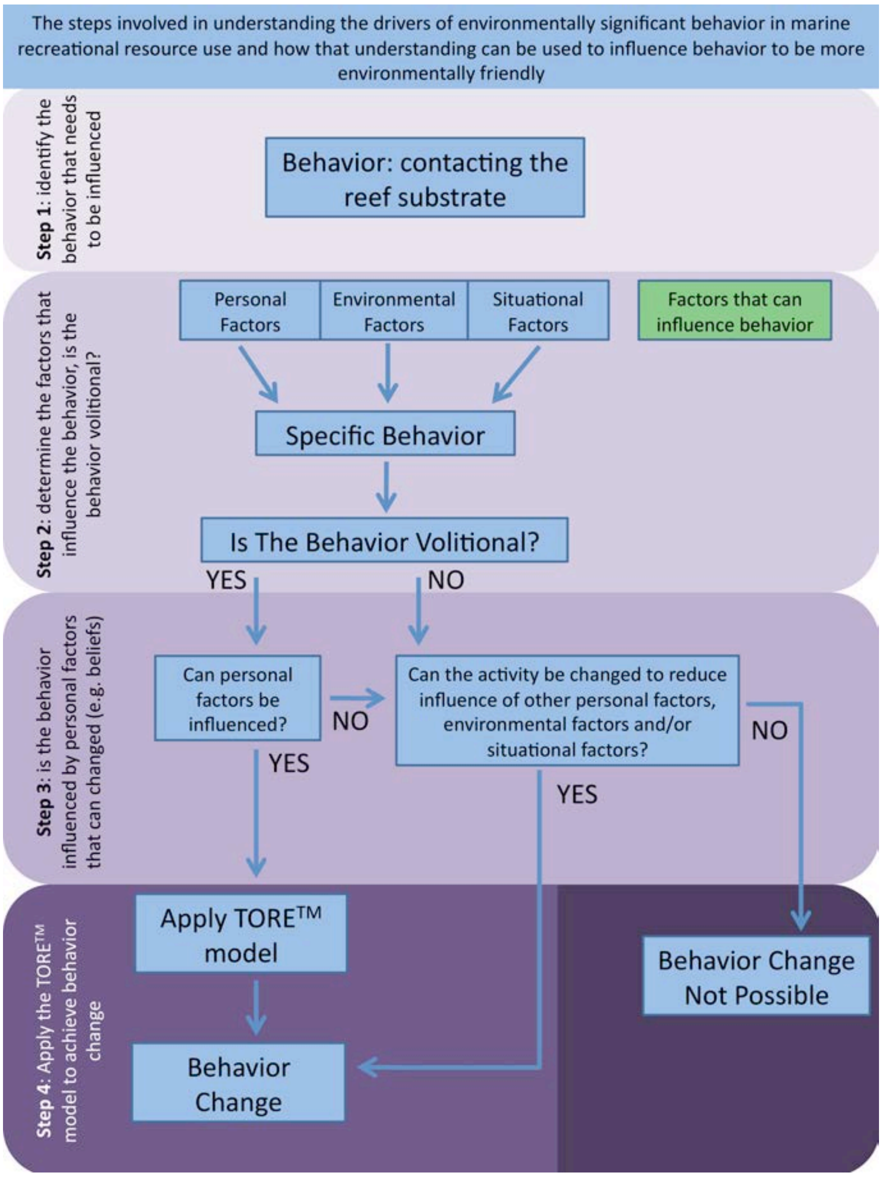


Figure 6.1. The theoretical framework used throughout this research project.

6.2. Implications of the Research

The theoretical framework developed for this research project was able to guide research efforts into understanding the drivers of environmentally significant behavior in marine recreational resource use. Furthermore, this theoretical framework was used successfully in understanding how to influence behavior to be more pro-environmental. This section describes the results of the research in context of the existing literature to show what was learned and how the findings contributed to the existing body of knowledge. Each research question is answered in this manner.

6.2.1. Research Questions

Research Question 1: What type of behavior do scuba divers and snorkelers exercise while engaged in their recreational activity? And what are the drivers that influence these behaviors of scuba divers and snorkelers?

Influencing the behavior of resource users into more pro-environmental behavior requires research in visitor behavior to determine if it is potentially damaging to the environment. The first data chapter (*Chapter 2*) explored the potentially damaging behavior of scuba divers and snorkelers during their interactions with marine resources throughout their recreational activities. This exploration revealed that the clientele of scuba dive and snorkel industries, as well as the experienced guides of those industries, made frequent contacts with the reef substrate. Once the target behavior (to be influenced) had been identified (in this study "not contacting the reef substrate") various factors that can influence behavior were examined to determine the drivers of the behavior, and more importantly, if the behavior was volitional.

This chapter revealed that there were personal and environmental factors that weakly influenced behavior of the scuba divers and snorkelers. The behavior of both the divers and the snorkelers was influenced by the personal factor of experience. For the divers increased experience resulted in fewer contacts. This is similar to studies conducted by Harriot et al. (1997) and Luna et al. (2009) in Australia and the Mediterranean respectively. However, in this research project, results also show that once the level of instructor was attained, the contacts made by scuba divers on the reef substrate increased again. Another study in the Mediterranean found that past diving experience did not have any influence on the contacts made by divers on the reef substrate (Di Franco et al., 2009). The experience levels of the snorkelers indicated that those with very little, and those with many years experience created more contacts than those with an intermediate level of experience. No existing literature has been able to link snorkeler experience to contact behavior. Thus, the influence of past experience on diver/snorkeler contacts is a complex issue and more research is needed to determine this influence, especially as Ong (2012) reports it to be the most important factor in explaining (scuba diver) behavior.

This chapter also identified one environmental factor (current) as slightly influencing the contact behavior of the scuba divers and snorkelers (more contacts as a result of current). This is similar to the findings on the Great Barrier Reef, Australia (Barker and Roberts, 2004, Harriott et al., 1997) but contrary to a study in the Caribbean which found no correlation between current and contacts (Barker and Roberts, 2004). Further research is required to determine exactly how current can influence visitor contact behavior. Barker and Roberts

(2004) investigated the influence of visibility on scuba diver contacts in St Lucia yet only differentiated between night-time vs. day-time diving, rather than different levels of day-time visibility as in this research project. Findings on snorkeler contact behavior and current were lacking in the existing literature. Further research into environmental factors and their influence on visitor behavior are needed.

Situational factors did not exert any influence on the behavior of the scuba divers and snorkelers in this research project. Other research that has investigated situational factors of scuba divers have studied different situational factors such as day-time vs. night-time diving, boat vs. shore diving, with cameras or without cameras (Barker and Roberts, 2004), the former all leading to more contacts with the substrate. Various authors have also examined the topography of a dive site and found that this factor does not influence the contacts of scuba divers (Rouphael and Inglis, 1997, Barker and Roberts, 2004, Luna et al., 2009). The research design of this project controlled for the afore mentioned situational factors and did not find any other contributing situational factors that influenced behavior. More research will be needed into all of the situational factors to determine their influence on visitor behavior.

Given the weak influence of these factors, the behavior of scuba divers and snorkelers is largely volitional (during "normal" dive/snorkel activities and not necessarily during reactionary instances such as panic or water in the snorkel). Other research has found that dive guide intervention or conservation-minded briefings can reduce impacts with diver behavior (Camp and Fraser, 2012, Luna et al., 2009, Medio et al., 1997, Barker and Roberts, 2004). The volitional behavior of the scuba divers and snorkelers, paired with possible interpretive efforts, could create more pro-environmental behavior. Results of this study also indicated that scuba divers required interventions aimed at the first 15 minutes of the scuba dive, found in other studies as well (Di Franco et al., 2009, Camp and Fraser, 2012, Barker and Roberts, 2004). Studies investigating the impacts and management of snorkelers have been lacking in the existing literature. This research project found that snorkelers required interventions that highlighted the use of seagrass and dead substrate areas throughout their snorkel activity.

Research Question 2: What are the driving salient beliefs of scuba divers and snorkelers, and how can these be targeted to influence behavior?

Chapter 3 identified the salient beliefs scuba divers and snorkelers held towards not contacting the reef substrate while they scuba dive or snorkel. Various studies have been completed that have examined diver's perceptions, attitudes, norms and awareness these divers have about the reef and the impacts associated with the reefs (Lucrezi et al., 2013b, Lucrezi et al., 2013a, Leujak and Ormond, 2007, Ong and Musa, 2012), however, these studies had several limitations. An understanding of behavior theory was not used to explain how these factors contributed to explaining behavior. Furthermore, actual behavior of visitors was not directly linked to the factors that were measured. This research project used an established method (Ham et al., 2009) to determine which beliefs are the most important beliefs (the salient beliefs) in deciding a particular behavior or course of action. Studies using this method have been conducted successfully in terrestrial nature based tourism (Ham et al., 2009, Powell and Ham, 2008) yet have never been conducted in a marine environment.

There are three types of salient beliefs that can influence behavior: behavioral beliefs (attitudinal), normative beliefs and/or control beliefs. In terrestrial studies the most common type of belief that dominates a particular behavior is a behavioral belief (Ham et al., 2009). Control beliefs rarely dominate behavior as park managers do not often ask visitors to do something they are incapable of doing (Ham et al., 2009). In this research project the behavioral beliefs were not the most common salient beliefs identified. For the snorkelers there existed only one behavioral belief and three normative beliefs. The normative beliefs are a result of societal pressure and since all the snorkeling excursions were led by a snorkel guide, this could explain why these beliefs were the most common (all three normative beliefs included the guide). For the scuba divers there existed two behavioral beliefs (one positive and one negative) and two normative beliefs. Again, all scuba dives are led by dive guide and this could explain why the normative beliefs equaled the behavioral beliefs. The divers and snorkelers each had two control beliefs that were classified as salient beliefs. For the snorkelers both of these salient beliefs could be influenced through the guide, whereas with the scuba divers, one of them related to the skill level of the diver, and the other to the surrounding water conditions. This indicates that in a marine environment, engaged in either diving or snorkeling, control beliefs could be more important than nature-based activities in a terrestrial environment.

There are four main types of interventions that can achieve resource management: physical (trails and fences); regulatory (rules and regulations); economic (entry fees, penalties); and educational (interpretation; Orams 1996). The first two methods of resource management have been the most frequently used, yet great potential exists for managing resources through an education-based method such as interpretation (Orams, 1996a). The physical method of resource management is difficult to implement in marine environments due to the three-dimensional and expansive characteristics of these types of protected areas (Agardy, 2000, Plathong et al., 2000, Salm, 1986), and the Mombasa Marine Park and Reserve is no exception. The regulatory method is present in the Mombasa Marine Park and Reserve, yet it only exists on paper as the manpower required to patrol and enforce these regulations is lacking. The entry fee system is active in the Mombasa Marine Park and Reserve but this only secures entry into the park, any accompanying rules are not communicated to the visitors. Penalties for breach of rules are not used in the marine park. When these three management regimes are not feasible, the remaining management intervention to use in achieving marine resource management is an education-based one in the form of interpretation, as identified by numerous authors (Young and Temperton, 2008, Carr, 2000, Agardy, 2000).

Interpretation must utilize the underlying behavior theory to guide its application and design for greatest efficacy (Marion and Reid, 2007, Tanner, 1999, Darnton, 2008, Orams, 1996b, Orams, 1997, Orams, 1994). It is also important that interpretation targets the salient beliefs of recreational resource users (Ham et al., 2009, Ham and Krumpe, 1996, Ballantyne and Packer, 2005), and more importantly, targets those salient beliefs that prevent recreational resource users from behaving in accordance with what is expected of them. When interpretation conveys messages that visitors already know, or what they already believe, the behavior of the visitors will not be influenced. One of the salient behavioral beliefs of scuba divers that this study identified was that ‘not coming near the coral reef meant that it would be protected’. However, this was a salient belief of those scuba divers who did not come near the reef, as well as of those scuba divers who did come near the reef (did not behave in accordance with target behavior). Therefore targeting this salient belief through management interventions would be ineffective if the aim was to stop those scuba divers from coming near the reef (the interpretation would be telling them what they already know/believe). Rather, the research found a salient belief that did differ between the two groups in the first 15 minutes of the scuba dive: ‘the environmental conditions’. Interpretive efforts would be better spent working with this salient belief if the ultimate aim was to prevent scuba divers from coming near to the reef. Interventions that could address this salient belief could consist of relevant messages, targeting environmental conditions, throughout the pre-dive briefing, and/or dive guide reminders throughout the initial stage of the dive.

Research Question 3: How can salient beliefs be incorporated into an interpretation program to influence the behavior of snorkelers?

The research from this point onwards focused only on the snorkelers due to logistical constraints of the research project. The number of salient beliefs that can be targeted depends on the resultant interpretation program that is to be designed for the recreational resource users. Interpretation programs with repetitive interactions and of long, continuous durations can target multiple salient beliefs (such as with the snorkelers) whereas those programs that consist of very brief, one-off encounters can only address 2-3 salient beliefs effectively (such as with the scuba divers). Furthermore, the salient beliefs identified in any elicitation study are specific to that geographical area and that specific behavior/activity (Ham et al., 2009). For example, this research project dealt with snorkelers in the Mombasa Marine Park and Reserve. The snorkelers in this project were mainly of British heritage. The Malindi Marine Park is situated approximately 120km north of Mombasa. The snorkeling excursions in this northerly park use similar boats yet the bulk of their clientele is of Italian heritage, and their reef system is different to the one in the Mombasa Marine Park and Reserve. These differences could result in the visitors of each park having different salient beliefs towards not contacting the reef when snorkeling. In their research of diver perceptions of coral reefs, Leujak and Ormond (2007) found that divers with different nationalities had different perceptions of coral reefs and as such their salient beliefs most likely would have been different. This was mirrored in a study on snorkelers on the Great Barrier Reef, Australia, where results indicated that different nationalities belonged to different benefit clusters of the snorkel excursion (Shafer et al., 1998).

The importance of these salient beliefs is that they guide the interpretation in delivering an effective message (Ham, 2007, Ballantyne and Packer, 2005, Pastorelli, 1998, Ham and Krumpe, 1996, Ballantyne et al., 1998, Ham et al., 2009). The Theory of Planned Behavior (TPB) was used as a tool to determine how behavior can be influenced. TPB shows that behavior is a result of intention, which in turn is determined by attitude, norms and perceived behavioral control. Each of these factors has underlying beliefs that influence those factors. The dominating underlying beliefs are the salient beliefs that must be targeted. Interpretation has been shown to be effective in influencing behavior of visitors (Aiello, 1998, Howard, 2000, Ballantyne and Packer, 2005, Orams, 1996b) provided it incorporates an understanding of behavior theory (Orams, 1994, Orams, 1997, Tanner, 1999, Darnton, 2008, Orams, 1996b). The findings from *Chapter 4* support this past research. Furthermore, the results of *Chapter 4* indicate that the salient beliefs identified in the previous chapter were identified correctly as the beliefs to target through interpretive efforts.

One limitation of past research that was addressed by *Chapter 4* was linking pre-existing beliefs of visitors to their actual behavior to determine the efficacy of interpretive efforts. This research project addressed this limitation by measuring the pre-existing beliefs of the interpretive audience to control for those pre-existing beliefs. Participants of both groups (those without any interpretation and those with interpretation) had similar attitudes, norms and control beliefs prior to the start of their snorkeling excursion. This indicates that any resultant differences between the two groups can be attributed to an effective interpretation program. The TORE™ model of persuasion was used to deliver the interpretive efforts. This method relies on messages being thematic, organized, relevant and enjoyable (Ham, 2007). The results of this research have shown that each of these principles was successfully applied to make the TORE™ model effective in this research, further strengthening the importance of how enjoyment links interpretation to effectively influencing behavior. Studies have shown how interpretive efforts can influence behavior (Aiello, 1998, Howard, 2000, Ballantyne and Packer, 2005, Orams, 1996b), and other studies have shown how enjoyment can also influence behavior (Moscardo et al., 2004, Moscardo, 1999). The TORE™ combines these two aspects of nature-based tourism. Research on scuba diving impacts have identified a similar need for interpretive efforts to combine enjoyment and behavioral components to manage visitor impacts (Townsend, 2008, Lucrezi et al., 2013a), yet this research on scuba divers is still lacking.

Research Question 4: What variables influence the effectiveness of guide interpretation?

The resultant interpretation for the snorkeling excursions used the guides (people who guide) as a medium of delivery of the interpretation throughout the snorkel excursions. The best method of interpretation has often been attributed to guides as they deliver a very personal interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Luck, 2003, Aiello, 1998). Guides tend to act as motivators in getting visitors to respect wildlife or adopt pro-environmental practices (Skanavis and Giannoulis, 2009, Zeppel, 2008, Zeppel and Muloin, 2008, Black and Ham, 2005). Furthermore, attributes such as the ability to demonstrate role-model behavior, manage visitor-wildlife interactions and enforce minimal impact behavior make guides properly and best placed to deliver interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003). Snorkelers hold guides in high esteem as demonstrated by visitors of this study. These visitors indicated that guides were the most important group of people that approved of them (the snorkelers) not contacting the reef substrate while snorkeling, and that guides were the ones most likely not to make contact with the reef substrate while snorkeling (*Chapter 3*). Guides therefore seem properly and best placed to deliver interpretation. Guides were trained in delivering this interpretation through their participation in a training workshop that consisted of expert presentations, group discussions and role-play scenarios (*Appendix 1*). Once the ‘new, interpretive’ excursions had been manifested within the excursions in the marine park the results indicated that the interpretive efforts created more pro-environmental snorkeling behavior and increased visitor satisfaction. The guides therefore effectively delivered the interpretive efforts to influence behavior.

The amount of elaboration in the group of respondents that had received interpretation during their snorkel excursion was higher than the elaboration of the other group. The only factor that was different between the respondents of both groups was the credibility of the source. Source credibility was found to be very important in a study conducted by Manfredo and Bright (1991) on wilderness users. Manfredo and Bright (1991) state “the more credible a communicator, the more persuasive he/she will be, particularly in situations where low processing of information occurs” (p5). The source throughout the excursions of the research project was the snorkel guide, and it was the snorkel guide that was taught the interpretive efforts. Furthermore, the respondents in the group with interpretation stated that they were more satisfied with the knowledge that the guide had. This result indicates that the interpretive training the snorkel guides completed, and the resultant interpretation they delivered to their clients, meant that they were viewed as a more credible source in the group with interpretation compared to the group without the interpretation. This finding most likely accounted for the increased elaboration their clients experienced. This is important as it indicates how essential it is to have a credible source delivering interpretive efforts.

Research Question 5: How can an interpretation program enhance the experience of snorkelers?

Interpretation also aims to enhance the experience of recipients. People who have had an enjoyable experience are usually the ones who will have learnt from the experience and altered their behavior accordingly (Moscardo et al., 2004). A properly designed interpretive program will achieve this enhanced experience and altered behavior. The interpretive efforts passed on to the snorkel guides and subsequently to the clientele were based on the TORE™ framework of interpretation and it proved to be successful in both enhancing the experience of recreational resource users and altering the behavior of resource users (*Chapter 4*). Coghlan (2012) completed a study of visitors to the Great Barrier Reef, Australia and found the following attributes important concerning increased satisfaction: diversity of the marine life, interactions with other passengers, comfort of the boat, quality of the entertainment, knowledgeable crew, quality of the information provided and the destination of the trip. The results of *Chapter 4* indicated that increased satisfaction was a result of the guided activities and/or presentation (amount of interaction, use of diagrams and wording of the information), helpfulness of the crew, appearance of the crew, behavior of other clients (on same boat and other boat) and knowledge of the guide, thereby supporting some of the findings made by Coghlan (2012).

An interpretation program can enhance the experience of visitors by catering to the needs of the visitors. Many studies have shown that nature-based tourism visitors want to learn when they partake in a nature excursion (Jacobson and Marynowski, 1997, Aiello, 1998, Luck, 2003). The results of *Chapter 4* support these findings as participants also indicated a strong desire to learn more about nature and coral reefs, and expressed the importance of the availability of information on marine life when they frequent a marine park. These findings indicate that visitors will be open to interpretive efforts and therefore achieve a greater sense of enjoyment from the interpretive efforts providing the attributes that generate satisfaction are present (Coghlan, 2012).

Research Question 6: If targeting salient beliefs in interpretive efforts results in behavior change, are these long-term or short-term behavior changes?

The Elaboration Likelihood Model illustrates how behavior change can be of long-term (central route) or short-term duration (peripheral route; Manfredo and Bright 1991, Ajzen 1992, Petty, McMichael et al. 1992, Breckler, Olson et al. 2006). As it was not possible to measure the behavior of the respondents months after their initial participation in the research project, it was decided to measure their behavioral beliefs rather than their actual behavior. Behavior change, paired with underlying beliefs that have been changed over time, would indicate the central route to persuasion (long-term behavior change), while behavior change without any change in the underlying beliefs would indicate the peripheral route to persuasion (short-term behavior change). Studies in the existing literature do not include inferring behavior by measuring behavioral beliefs at some point in the future.

Only one of 11 measured beliefs differed significantly between those participants who had received interpretation and those who had not during the excursion six to 14 months later. These results suggest that the behavior change witnessed during the snorkel excursion may not have been a long-term behavior change. The peripheral route to persuasion was activated by interpretive efforts during the snorkel excursion (Petty et al., 1992). According to the ELM of the theoretical framework the type of behavior change, short- or long-term, depends of the amount of elaboration (Petty et al., 1992, Ham et al., 2009). Even though participants of the interpretive group displayed more elaboration, it was not enough to create long-term behavior (belief) change. Factors that can influence the amount of elaboration include prior knowledge, topic involvement, direct experience, need for cognition, social status in group, and/or source credibility (Manfredo and Bright, 1991). Some or all of these factors may need to be targeted in future interpretive efforts to achieve long-term behavior change. Even though actual behavior was not measured in the follow-up study, the data gathered on behavioral beliefs suggests that the behavior of the respondents would not have been altered six to 14 months after their initial behavior was altered. This method of inferring future behavior needs more research to determine the efficacy of using it to accurately infer future behavior for resource management uses.

Summary of Research

The results indicate that the theoretical framework applied throughout this study was successful in understanding the behavior of resource users and what it takes to influence this behavior. Visitor behavior was shown to be largely volitional as no behavioral drivers were found to exert a dominating influence. TPB is able to explain behavior if the target behavior is volitional (Ajzen, 1985). Making use of TPB, within the context of the developed theoretical framework, the researcher identified the salient beliefs the visitors held towards not contacting the reef substrate whilst scuba diving/snorkeling. Applying the TORE^{TM} model of persuasion, these salient beliefs were then effectively incorporated into an interpretive program and delivered to the clientele of the snorkel industry within the Mombasa Marine Park and Reserve.

If behavior of the visitors was influenced for the short-term, and their behavioral beliefs were altered after six months, it could indicate that long-term behavior change was evident. This long-term behavior change could then remain altered throughout any future resource interactions in other geographic locations. The results of this research project suggest that marine resources globally would not benefit from the short-term, altered behavior described in this thesis, as behavioral beliefs were not altered after six months. Changing behavior for the long-term is a process that has many different steps. This research demonstrated that the first step (short-term behavior change) was completed successfully. More research into the steps required to achieve long-term behavior change is necessary. Even though future marine resource interaction might not be safeguarded, the local resources did benefit and were afforded a degree of protection from damaging impacts. The snorkel guides in the local area delivered the interpretation to their clientele and as a result their local resources were protected. The effects of this particular interpretation program were thus very positive and immediate.

6.3. Implications for Management

Management can choose one of the four management regimes, mentioned earlier (Orams, 1996a), to manage resources under their jurisdiction. The physical characteristics of a marine protected area, as mentioned previously (3-D, no physical boundaries), create obstacles for most methods rendering them inefficient. This fact is especially important in Kenyan marine parks as they often do not have the resources to maintain, patrol and enforce the rules and regulations of the marine parks (den Haring, pers obs). The education-based method is therefore the optimal choice, however, it is the least used in the management of resources (Orams 1996). As demonstrated by this research project, designing an interpretation program to be delivered to park visitors via the existing snorkel industry enhances the credibility of those members included in the delivery of the interpretation. This further strengthens the bond between the management authority of the marine resources and those responsible for interacting with those resources (the coastal community involved with the snorkel industry). Using the theoretical framework developed for this research project will enhance the efficacy of the resultant interpretive efforts and ensure that salient beliefs are discovered and targeted.

Interpretation programs have been shown to influence behavior (Mayes and Richins, 2008, Zeppel, 2008, Orams and Hill, 1998, Madin and Fenton, 2004, Moscardo et al., 2004, Luck, 2003, Roggenbuck, 1992) and they have been used as a management tool in protected areas (Orams, 1997, Luck, 2003, Pomeroy et al., 2004). However, the bulk of these programs have not been designed using the underlying behavior theory or have not been adequately tested for effectiveness (Orams, 1996b, Orams, 1997, Orams, 1994, Tanner, 1999, Darnton, 2008). The current research project has shown that a properly designed interpretive program, based on the developed theoretical framework, can result in favorable outcomes in line with the management plan of a protected area.

The Kenyan management authority of natural parks (the Kenya Wildlife Service (KWS)) was actively involved in the training workshop that introduced the interpretive methods to the snorkel industry members. Results included amicable feelings towards the KWS from the coastal community. The training workshop was enthusiastically received by the KWS and upon completion of the training workshop, and the overall results of the interpretive efforts, the KWS pledged to take up similar training workshops for other areas along the Kenyan coastline into their upcoming management budgets. Various non-governmental organizations along the Kenyan coastline also vowed to actively get involved with similar training in their respective geographic areas along the coastline as a result of this research project.

Although the underlying theory and theoretical framework are easily transferrable to other geographic areas (be they within, or beyond, Kenyan borders), an elicitation study must be conducted prior to the design and manifestation of any interpretive efforts. The salient beliefs of a sample in a different geographic area could be similar, yet this cannot be assumed (Ham et al., 2009). Furthermore, the importance of the elicitation study is further evident by various studies that have shown that the salient beliefs of recreational resource users cannot be guessed; they must be identified (Luck, 2003, Jacobson and Marynowski, 1997, Absher et al., 1988, Glaspell et al., 2003). Often times protected area managers believe they know what the resource users in those protected areas are thinking and design interpretation based on this knowledge. These interpretive efforts are futile as resource users and protected area managers often differ on their views towards a protected area (Absher et al., 1988, Glaspell et al., 2003, Watson and Roggenbuck, 1998).

The same theoretical framework could also be transferred to terrestrial protected areas. The ideal outcome for any of these programs would be that sufficient elaboration occurs causing the central route to persuasion to be activated within the visitor. This route will then translate into long-term belief changes of the visitor leading to permanently altered behavior of the resource user, and ultimately resulting in resources globally having been afforded protection.

6.4. Methodological Limitations

Various limitations did exist throughout this research project that may have influenced the results of the research, or require that the interpretation of the results keep those limitations in mind. The data collection of scuba divers was conducted through the use of one dive operator within the Mombasa Marine Park and Reserve. Four other dive operators existed within the confines of the park. The operator that was used throughout the research project was the highest accredited dive center within the park (PADI Five Star IDC Center) and had the highest rating of environmental commitment (illustrated through past achievements and awards). These factors may have influenced the clientele to choose this dive center over the others within the park, however, it seems more likely that most clients chose a dive center based on which resort they stayed at (each resort has one dive center represented within it; den Haring pers obs).

Throughout the data collection of the behavior of the snorkelers and scuba divers, the data gathered on the clients took precedence over the data gathered on the guides (dive/snorkel). The position of the researcher was optimally placed so that maximum data could be collected for the clients of the excursions, this occasionally meant sacrificing data collection of the guides. At times the sample sizes of the guides could have been slightly larger and more data gathered on the behavior of the guides would have been ideal.

The methods used to collect data on resource user impacts were different for snorkelers and scuba divers. For the scuba divers the target behavior chosen was “near contacts” (<10cm) whilst for the snorkelers it was actual contacts. The potentially damaging behavior of divers and snorkelers was never intended to be compared to each other and pilot monitoring data indicated differences in how these user groups interacted with the resources. Scuba divers made frequent “near contacts” yet fewer actual contacts whilst the snorkelers made frequent actual contacts. For the purposes of being able to compare impacts of both user groups more compatible methods could have been chosen. Furthermore, with the scuba divers efforts were made to monitor data throughout the entire dive to be able to differentiate between the first segment of the dive compared to the subsequent segments. For the snorkelers it was chosen to examine seven minutes of monitoring randomly throughout the snorkel duration. This latter methodology was chosen as pilot monitoring data suggested that contact behavior throughout the snorkel was fairly constant. More research would be needed to validate this assumption.

The methodology for the elicitation study for the snorkelers only asked participants to free-list responses to the eight questions and did not take into account how important each belief was (only conducted the first part of the methods). Additional work would reveal the importance of each belief. For any belief there exists a strength measure and an evaluation, motivation to comply, and power measure for behavioral, normative and control beliefs respectively (Ham et al., 2009). Both measures of each of those beliefs need to be examined and compared across the 'compliers' and 'non-compliers' groups (regardless if it was a commonly measured belief by both 'compliers' and 'non-compliers'). It was decided not to complete the second phase of the methodology due to the nature of the interpretive efforts: continued and repetitive interaction. It was not necessary to shorten the list of six beliefs any further as long as all six beliefs were addressed during the interpretation. However, had more time been available to conduct the second phase of the elicitation study (such as with the scuba divers), more directed efforts could have been incorporated in the design and manifestation of the interpretation program.

During the elicitation portion of the research, the salient beliefs of guides were not identified for the scuba divers, nor for the snorkelers. Determining the salient beliefs of the guides may have added valuable data that could have streamlined the resultant interpretation to increase its efficacy targeting both clients and guides. Furthermore, since the behavior of the snorkel guides and scuba diving guides was similar to that of their clientele (with regards to frequent contacts), addressing the salient beliefs of the guides may have had more success in influencing the behavior of the guides. The elicitation study for the scuba divers did not have an equal distribution of 'compliers' to 'non-compliers' (there were fewer 'compliers' than 'non-compliers'). Time constraints halted the data collection of this study, but ideally the data collection would have continued until there were at least 50 'compliers' and 50 'non-compliers' (Ham et al., 2009).

The criteria used to select the salient beliefs after the first phase of the elicitation study were implemented to keep the list of salient beliefs manageable, and therefore manage the length of the questionnaire. For the scuba divers, every belief measure that is carried forward to the second phase of the elicitation study translates into two questions being added to the questionnaire used throughout that phase (Ham et al., 2009). As the questionnaire was completed by the visitors upon return to the dive center, right before lunch, efforts were made to keep the survey tool succinct allowing participants to complete it honestly and in full (Czaja and Blair, 2005, Dillman et al., 2009).

Once participants of the training workshop had completed the training, they resumed their posts within the snorkel industry. Future extension of this work should include regular (fortnightly or monthly) feedback sessions to assist the graduates with the implementation of the interpretive efforts. These feedback sessions could have been used to share success stories, learn from challenges and discuss any issues the graduates were faced with. Furthermore, the tour operators of the area should be incorporated to gain support and recognition for the training, and institutionalizing the training to reduce the impacts in the sea, improve client satisfaction and upgrade operator skills. The latter may then result in increased business potential for the operators. The above mentioned factors may have resulted in the guides embracing the practices of the workshop more often than indicated by the data (*Appendix 1*) as not all guides, or boats, adhered to the practices of the workshop. In addition, not all the guides used the interpretive materials consistently, despite repeated reminders from the KWS and the workshop trainers. However, even with the less-than-optimal use of the materials, behavior was still influenced and experiences enhanced. More consistent use of the materials would only have amplified those results.

The questionnaires used throughout the main section of the research project (snorkelers: pre-excursion and post-excursion questionnaires) were very much dependent on length constraints. As respondents completed these questionnaires in their own free time while on holiday, and during an excursion, the questionnaires could not be too lengthy. Various questions that could have revealed data of interest had to be discarded from the questionnaire as a lengthy questionnaire could have resulted in irritability of the respondents and an increase in uncompleted questionnaires. The integrity of the research was not compromised with the final versions of the questionnaires as the most important data were collected. The questionnaires were available in three languages: English, French and German. Participants of this study therefore had to be able to read and write in English, French or German to be included in this study. Furthermore, only those participants that indicated intent to snorkel were included in this study and invited to participate in the research project (the snorkel behavior of the participant was necessary).

6.5. Future Research Priorities

The results of this research project have identified several gaps that should be the focus of future research priorities. Factors that influence the behavior of visitors require further research, as results of this research project were not always consistent with findings of previous research. Apart from personal, environmental and situational factors that influence behavior, future research should also focus on cultural factors and the influence they could exert on visitor behavior. Past studies on snorkeler behavior on the Great Barrier Reef, Australia (Shafer et al., 1998), and visitors to the Red Sea, Egypt (Leujak and Ormond, 2007) have shown that different cultural backgrounds result in different perceptions of resources and the associated benefits.

This research project has shown how an interpretive program based on the salient beliefs of visitors (snorkelers) was successful in influencing behavior and enhancing visitor satisfaction. Similar research is needed focusing on scuba divers. Previous research (Lucrezi et al., 2013a, Townsend, 2008) has indicated that interpretive efforts should combine research on visitor enjoyment and research on behavioral components to create an effective management intervention for scuba divers to manage visitor impacts.

Further research is also required into the incorporation of the salient beliefs into the interpretive efforts and interpretive materials to determine how long-term belief changes (and therefore behavior changes) can be achieved. Using the Elaboration Likelihood Model it was decided that the peripheral route to persuasion was activated in this research project (Petty et al., 1992). More elaboration could have activated the central route to persuasion, and continued research is needed in this area.

The future application of this research could be targeted along the Kenyan coast. The Kenya Wildlife Service has already expressed a desire to replicate the training workshop conducted for the snorkel operators in the Mombasa Marine Park and Reserve throughout the remaining marine protected areas along the Kenyan coastline under their jurisdiction. The implementation of these workshops should be preceded by an elicitation study to determine what the salient beliefs are of the snorkelers in those protected areas. The materials that were designed for the Mombasa Marine Park and Reserve can easily be amended to reflect any differences between the various marine protected areas.

6.5. Final Conclusion

Threats to coral reefs are increasing as a result of impacts by visitors to the marine resources (Allison, 1996, Barker and Roberts, 2004, Hawkins et al., 1999). Management interventions are required to manage how resource users interact with these resources (Orams, 1996b). One such an intervention is the use of interpretation to minimize damaging impacts and promote pro-environmental visitor behavior (Moscardo et al., 2004). Interpretation has the potential to influence behavior yet little research exists in the field of recreational marine resource use (Orams, 1997, Luck, 2003, Pomeroy et al., 2004). Results of this study revealed which factors influenced the visitor behavior of scuba divers and snorkelers. This behavior was considered to be largely volitional and therefore susceptible to interpretive efforts. The interpretive efforts were based on the most important beliefs snorkelers held towards the target behavior of not contacting the reef substrate. The findings of this research indicate that interpretation guided by behavior theory, and knowledge of the drivers of behavior, can assist with reducing potentially damaging impacts by visitors. Future research is needed to investigate how salient beliefs of scuba divers can be targeted to minimize damaging impacts, and also how immediate behavior change can be manifested for a long-term period. The contribution of this thesis has hopefully created a platform for future research into minimizing potentially damaging impacts by visitors and encouraging pro-environmental behavior in marine recreation settings.

6.6. Ethical Review

This PhD research project conformed to all ethical stipulations set forth by James Cook University. The researcher obtained all necessary ethical permissions from the participants prior to the start of data collection. All personal data (name, date of birth, email address) were kept confidential and no names were mentioned of participants throughout the research project in this thesis or subsequent publications. The relevant ethics committee of James Cook University granted ethics approval for this project.

Reference List

Absher, J.D., McAvoy, L.H., Burdge, R.J., & Gramann, J.H. (1988). Public and Commercial Managers Predicting Recreationist Opinions. *Journal of Park and Recreation Administration, 6(3)*, 66-77.

Agardy, T. (2000). Information needs for marine protected areas: scientific and societal. *Bulletin of Marine Science, 66(3),* 875-888.

Aiello, R. (1998). Interpretation and the Marine Tourism Industry, Who needs it?: Great Adventures, Australia. *Journal of Tourism Studies, 9*, 51-61.

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior*. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). Berlin: Springer-Verlag.

Ajzen, I. (1988). *Attitudes, personality, and behavior*. Chicago: The Dorsey Press.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50(2)*, 179-211.

Ajzen, I. (1992). *Persuasive communication theory in social psychology: A historical perspective*. In M. Manfredo & M. Fishbein (Eds.), *Influencing Human Behavior: theory and applications in recreation, tourism, and natural resources management*. Illinois: Sagamore Publishing Co. Inc.

Ajzen, I. (2005). *Laws of Human Behavior: Symmetry, Compatibility, and Attitude- Behavior Correspondence*. In B. B. A. Beauducel, M. Bosniak, W. Conrad, G. Schönberger, and D. Wagener (Eds.), *Multivariate Research Strategies* (pp. 355). Maastricht: Shaker Verlag GmbH.

Ajzen, I, & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour.* Englewood Cliffs, NJ : Prentice-Hall.

Alcock, D. (1991). Education and Extension: Managementís best strategy. *Australian Parks and Recreation, 27(1)*, 15-17.

Alderson, W.T., & Low, S.P. (1985). *Interpretation of historic sites, Nashville, TN: American Association for State and Local History*. Quoted in D.M. Knudson T.T. Cable and L. Beck (1995). *Interpretation of cultural and natural resources*. State College, Pennsylvania: Venture.

Allison, W. R. (1996). Snorkeler damage to reef corals in the Maldive Islands. *Coral Reefs, 15(4)*, 215-218.

Almagor, U. (1985). A tourist's" Vision Quest" in an African game reserve. *Annals of Tourism Research, 12(1)*, 31-47.

Anderson, L.E., & Loomis, D.K. (2011). SCUBA Diver Specialization and Behavior Norms at Coral Reefs. *Coastal Management, 39(5)*, 478-491.

Anderson, U.S., Kelling, A.S., Pressley-Keough, R., Bloomsmith, M.A., & Maple, T.L. (2003). Enhancing the zoo visitor's experience by public animal training and oral interpretation at an otter exhibit. *Environment and Behavior, 35(6)*, 826.

Anonymous (2012). *Triandis' Theory of Interpersonal Behaviour*. Retrieved from www.energy-behave.net/pdf/Triandis_theory.pdf

Anonymous. (2012). *Interpretation and Management Plan 2012*. In Annabel Wills Architects Pty Ltd (Ed.), (pp. 63).

Archer, D., & Griffin, T. (2004). *Visitor Use and Satisfaction in Barrington Tops National Park.* QLD: CRC for Sustainable Tourism Pty Ltd.

Archer, D., & Griffin, T. (2005). *Study of visitor use and satisfaction in Mungo National Park*. QLD: CRC for Sustainable Tourism.

Armstrong, E.K., & Weiler, B. (2003). *Improving the tourist experience: Evaluation of interpretation components of guided tours in national parks*. QLD: Co-operative Research Centre for Sustainable Tourism Pty Ltd.

Armstrong, E.K., & Weiler, B. (2002). Getting the message across: An analysis of messages delivered by tour operators in protected areas. *Journal of Ecotourism, 1(2-3)*, 104-121.

Baldassare, M., & Katz, C. (1992). The personal threat of environmental problems as predictor of environmental practices. *Environment and Behavior, 24(5)*, 602.

Ballantyne, R., & Hughes, K. (2001). Interpretation in Ecotourism Settings: Investigating tour guides' perceptions of their role, responsibility and training needs. *Journal of Tourism Studies, 12(2)*, 2-9.

Ballantyne, R., & Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: what is the state of the game? *Environmental Education Research, 11(3)*, 281-295.

Ballantyne, R., Packer, J., & Beckmann, E. (1998). Targeted interpretation: exploring relationships among visitors' motivations, activities, attitudes, information needs and preferences. *The Journal of Tourism Studies (Australia), 9(2)*, 12.

Ballantyne, R., Packer, J., & Hughes, K. (2009). Tourists' support for conservation messages and sustainable management practices in wildlife tourism experiences. *Tourism Management, 30(5)*, 658-664.

Bamberg, S., & Schmidt, P. (2003). Incentives, morality, or habit? Predicting students' car use for university routes with the models of Ajzen, Schwartz, and Triandis. *Environment and Behavior, 35(2)*, 264.

Barker, N.H.L., & Roberts, C.M. (2004). Scuba diver behaviour and the management of diving impacts on coral reefs. *Biological Conservation, 120(4)*, 481-489.

Beaumont, N. (1998). *Promoting pro-environmental attitudes and behaviours through ecotourism: That is the theory but does it happen in practice?* In: McArthur, S. and Weiler, B. (Eds) *Australia's Ecotourism Industry: A Snapshot in 1998*. Brisbane: Ecotourism Association of Australia, 21-28.

Beckmann, E.A. (1991). *Environmental interpretation for education and management in Australian National Parks and other protected areas*. PhD thesis, University of New England, Armidale, NSW.

Bickman, L. (1972). Environmental attitudes and actions. *The Journal of Social Psychology, 87(2)*, 323-324.

Birtles, A., Valentine, P., Stoeckl, N., Sobtzick, S., Curnock, M., & Farr, M. (2010). Impacts and threats to key reef sites and marine species in the Great Barrier Reef Marine Park. Draft Issues Paper. SEES and SoB. James Cook Univeristy.

Black, J.S., Stern, P.C., & Elworth, J.T. (1985). Personal and contextual influences on household energy adaptations. *Journal of Applied Psychology, 70(1),* 3-21.

Black, R., & Ham, S. (2005). Improving the quality of tour guiding: Towards a model for tour guide certification. *Journal of Ecotourism, 4(3),* 178-195.

Bogner, F.X. (1998). The influence of short-term outdoor ecology education on long-term variables of environmental perspective. *The Journal of Environmental Education, 29(4),* 17-29.

Bradley, J.A. (1979). *A human approach to reducing wildland impacts*. In R. Ittner, D. R. Potter, J. K. Agee & S. Anshell (Eds.), *Proceedings of Recreational Impact on Wildlands. USDA Forest Service, Pacific Northwest region*. Portland, OR (pp. 222-226).

Bramley, R., & Carter, B. (1992). *Bridging the gap between resource protection and tourism utilization in ecotourism*; 1991 Conference Papers. University of Queensland, Bureau of Tourism Research, Australia.

Bratt, C. (1999). The impact of norms and assumed consequences on recycling behavior. *Environment and Behavior, 31(5),* 630.

Breckler, S.J., Olson, J.M., & Wiggins, E.C. (2006). *Social psychology alive*. California: Thomson/Wadsworth.

Brown, K., Adger, W.N., Tompkins, E., Bacon, P., Shim, D., & Young, K. (2001). Trade-off analysis for marine protected area management. *Ecological Economics, 37(3),* 417-434.

Buckley, R. (2000). Tourism in the most fragile environments. *Tourism Recreation Research, 25(1),* 31-40.

Cacioppo, J.T., Petty, R.E., & Morris, K.J. (1983). Effects of need for cognition on message evaluation, recall, and persuasion. *Journal of Personality and Social Psychology, 45(4),* 805-818.

Camp, E., & Fraser, D. (2012). Influence of conservation education dive briefings as a management tool on the timing and nature of recreational SCUBA diving impacts on coral reefs. *Ocean & Coastal Management, 61,* 30-37.

Carr, M.H. (2000). Marine protected areas: challenges and opportunities for understanding and conserving coastal marine ecosystems. *Environmental Conservation, 27(02),* 106-109.

Carr, M.H., Neigel, J.E., Estes, J.A., Andelman, S., Warner, R.R., & Largier, J.L. (2003). Comparing marine and terrestrial ecosystems: implications for the design of coastal marine reserves. *Ecological Applications, 13(sp1),* 90-107.

Cater, C.I. (2008). The life aquatic: Scuba diving and the experiential imperative. *Tourism in Marine Environments, 5(4),* 233-244.

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology, 39(5),* 752-766.

Chase, D.R., & Harada, M. (1984). Response error in self-reported recreation participation. *Journal of Leisure Research, 16(4)*, 322-329.

Cinner, J.E. (2007). Designing marine reserves to reflect local socioeconomic conditions: lessons from long-enduring customary management systems. *Coral Reefs, 26(4),* 1035-1045.

Coghlan, A. (2012). Facilitating reef tourism management through an innovative importance-performance analysis method. *Tourism Management, 33(4),* 767-775.

Cole, D.N., Hammond, T.P., & McCool, S.F. (1997). Information quantity and communication effectiveness: Low-impact messages on wilderness trailside bulletin boards. *Leisure Sciences, 19(1)*, 59-72.

Curtin, S., & Garrod, B. (2008). *Vulnerability of marine mammals to diving tourism activities*. In B. Garrod & S. Gössling (Eds.), *New frontiers in marine tourism: Diving experiences, sustainability, management* (pp.93-113). Amsterdam: Elsevier.

Curtis, J. (2008). *Influencing Visitor Use of Alternative Transportation Systems in Australian National Parks: An Application of the Theory of Planned Behaviour*. PhD thesis (Doctor of Philosophy), Monash University, Australia.

Czaja, R., & Blair, J. (2005). *Designing surveys*. California: Sage Publications Inc.

Dahlstrand, U., & Biel, A. (1997). Pro-environmental habits: Propensity levels in behavioral change. *Journal of Applied Social Psychology, 27(7)*, 588-601.

Darnton, A. (2008). *Behaviour change knowledge review*. Government Social Research Unit.

Davis, D., Banks, S., Birtles, A., Valentine, P., & Cuthill, M. (1997). Whale sharks in Ningaloo Marine Park: managing tourism in an Australian marine protected area. *Tourism Management, 18(5)*, 259-271.

Davis, D., & Tisdell, C. (1995). Recreational scuba-diving and carrying capacity in marine protected areas. *Ocean and Coastal Management, 26(1)*, 19-40.

De Young, R. (1990). Recycling as appropriate behavior: A review of survey data from selected recycling education programs in Michigan. *Resources, Conservation and Recycling, 3(4)*, 253-266.

Dearden, P., Bennett, M., & Rollins, R. (2006). Implications for coral reef conservation of diver specialization. *Environmental Conservation, 33(0*4), 353-363.

Dearden, P., Bennett, M., & Rollins, R. (2007). Perceptions of diving impacts and implications for reef conservation. *Coastal Management, 35(2-3)*, 305-317.

den Haring, S.D. (2014). *Effective Interpretation for Recreational Marine Resource Use in the Mombasa Marine Park and Reserve, Kenya*. PhD thesis, James Cook University, Australia.

Di Franco, A., Milazzo, M., Baiata, P., Tomasello, A., & Chemello, R.. (2009). Scuba diver behaviour and its effects on the biota of a Mediterranean marine protected area. *Environmental Conservation, 36(1)*, 32.

Dillman, D.A., Smyth, J.D., & Christian, L.M. (2009). *Internet, mail and Mixed-Mode Surveys: The Tailored Design Method 3 rd ed*. New Jersey: John Wiley & Sons.

Dimmock, K. (2009). Finding comfort in adventure: experiences of recreational SCUBA divers. *Leisure Studies, 28(3)*, 279-295.

Doherty, M. & Newton, D. (1998). *Commercial visitor interpretation program: Easter 1998 audit report*. Victoria: Parks Victoria.

Dresner, M., & Gill, M. (1994). Environmental education at summer nature camp. *The Journal of Environmental Education, 25(3)*, 35-41.

Eagles, P.F.J., McCool, S.F., & Haynes, C.D. (2002). *Sustainable tourism in protected area: guidelines for planning and management*. Gland, Switzerland: International Union for the Conservation of Nature.

Finger, M. (1994). From knowledge to action? Exploring the relationships between environmental experiences, learning, and behavior. *Journal of Social Issues, 50(3)*, 141-160.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. MA: Addison-Wesley.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behaviour*. New York: Taylor & Francis.

Forestell, P.H. (1991). *Marine education and ocean tourism: Replacing parasitism with symbiosis*. In M.L.Miller & Auyong (Eds) *Proceedings of the 1990 Congress on Coastal and Marine Tourism. Vol. 1*. NCRI-T-91-010. Newport, OR: National Coastal Resources Research & Development Institute. Pp.35-39.

Forestell, P.H. (1993). If Leviathan has a face, does Gaia have a soul?: Incorporating environmental education in marine eco-tourism programs. *Ocean & Coastal Management, 20(3)*, 267-282.

Francis, J.J., Eccles, M.P., Johnston, M., Walker, A.E., Grimshaw, J.M., Foy, R., Kaner, E.F., Smith, L., & Bonetti, D. (2004). *Constructing questionnaires based on the theory of planned behaviour*. Newcastle Upon Tyne, United Kingdom: Centre for Health Services Research.

Garrod, B., and Gossling, S. (2008). *New frontiers in marine tourism: Diving experiences, sustainability, management*. Amsterdam: Elsevier.

Geva, A., & Goldman, A. (1991). Satisfaction measurement in guided tours. *Annals of Tourism Research, 18(2),* 177-185.

Glaspell, B., Watson, A., Kneeshaw, K., & Pendergrast, D. (2003). Selecting indicators and understanding their role in wilderness experience stewardship at Gates of the Arctic National Park and Preserve. *The George Wright Forum, 20(3)*, 59-71.

Glickman, S.E. (1995). The spotted hyena from Aristotle to the Lion King: reputation is everything. *Social Research, 62(3)*, 501-537.

Gralton, A., Sinclair, M., & Purnell, K. (2004). Changes in Attitudes, Beliefs and Behaviour: A Critical Review of Research into the Impacts of Environmental Education Initiatives. *Australian Journal of Environmental Education, 20(2)*, 12.

Griffin, T., & Archer, D. (2005). *Visitor Study 1999-2000: Northern New South Wales National Parks*. QLD: CRC for Sustainable Tourism.

Grob, A. (1995). A structural model of environmental attitudes and behaviour. *Journal of Environmental Psychology, 15(3)*, 209-220.

Haig, I. (1997). *Viewing nature: Can the guide make the difference?* Thesis (Master of Arts), Griffith University, unpublished.

Ham, S. (1992). *Environmental Interpretation: A Practical Guide for People with Big Ideas and Small Budgets*. Golden, Colorado: Fulcrum Publishing.

Ham, S. (2003). *Ecotourism making a difference by making meaning*. Paper presented at the Keynote address to the Ecotourism Association of Australia.

Ham, S. (2007). *Can interpretation really make a difference? Answers to four questions from cognitive and behavioral psychology*. Paper presented at the Interpreting World Heritage Conference, Vancouver, Canada.

Ham, S., Brown, T., Curtis, J., Weiler, B., Hughes, M., & Poll, M. (2009). *Promoting Persuasion in Protected Areas: A guide for managers who want to use strategic communication to influence visitor behaviour*. QLD: CRC.

Ham, S., & Krumpe, E.E. (1996). Identifying Audiences and Messages for Nonformal Environmental Education--A Theoretical Framework for Interpreters. *Journal of Interpretation Research, 1(1)*, 11-23.

Ham, S., & Weiler, B. (2005). *Interpretation Evaluation Tool-kit: Methods and Tools for Assessing the Effectiveness of Face-to-face Interpretive Programs.* QLD: Sustainable Tourism CRC.

Ham, S., & Weiler, B. (2006). *Development of a research-based tool for evaluating interpretation*. QLD, Australia: CRC for Sustainable Tourism.

Hammitt, W.E. (1984). Cognitive processes involved in environmental interpretation. *Journal of Environmental Education, 15(4)*, 11-15.

Hammitt, W.E., & Cole, D.N. (1998). *Wildland recreation: ecology and management.* New York: John Wiley & Sons.

Harland, P., Staats, H., & Wilke, H.A. (1999). Explaining proenvironmental intention and behavior by personal norms and the theory of planned behavior. *Journal of Applied Social Psychology, 29(12)*, 2505-2528.

Harriott, V.J., Davis, D., & Banks, S.A. (1997). Recreational diving and its impact in marine protected areas in eastern Australia. *Ambio, 26(3)*, 173-179.

Hawkins, J.P., & Roberts, C.M. (1993). Effects of recreational scuba diving on coral reefs: trampling on reef-flat communities. *Journal of Applied Ecology, 30(1)*, 25-30.

Hawkins, J.P., Roberts, C.M., Hof, T. van't, Meyer, K. de, Tratalos, J., & Aldam, C. (1999). Effects of Recreational Scuba Diving on Caribbean Coral and Fish Communities. *Conservation Biology, 13(4)*, 888-897.

Hendee, J.C., & Dawson, C.P. (2002). *Wilderness visitor management: Stewardship for quality experiences Wilderness Management: Stewardship and Protection of resources and values*. Golden, Colorado: Fulcrum Publishing.

Hendee, J.C., Stankey, G.H., & Lucas, R.C. (1978). *Wilderness management*. Miscellaneous Publication 1365. Washington DC: US Department of Agriculture, Forest Service.

Hendee, J.C., Stankey, G.H., & Lucas, R.C. (1990). *Wilderness management: philosophical direction. Wilderness management* (2nd ed.). Golden, Colorado: North American Press.

Hendricks, W.W. (2000). *Attitudes toward roles in a wilderness education program*. USDA Forest Service Proceedings RMRS-P-15-VOL-4.

Higginbottom, K. (2004). *Wildlife tourism: Impacts, Management and Planning*. Altona: Common Ground Publishing.

Higham, J., & Carr, A. (2002). Ecotourism visitor experiences in Aotearoa/New Zealand: challenging the environmental values of visitors in pursuit of pro-environmental behaviour. *Journal of Sustainable Tourism, 10(4)*, 277-294.

Higham, J., & Carr, A. (2003). Sustainable wildlife tourism in New Zealand: An analysis of visitor experiences. *Human Dimensions of Wildlife, 8(1)*, 25-36.

Hines, J.M., Hungerford, H.R., & Tomera, A.N. (1986). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education, 18(2)*, 1-8.

Hoegh-Guldberg, O., Mumby, P.J., Hooten, A.J., Steneck, R.S., Greenfield, P., Gomez, E., Caldeira, K. (2007). Coral reefs under rapid climate change and ocean acidification. *Science, 318(5857)*, 1737-1742.

Howard, J. (2000). Research in progress: does environmental interpretation influence behaviour through knowledge or affect? *Australian Journal of Environmental Education, 15*, 153-156.

Howard, J.L. (1999). How do scuba diving operators in Vanuatu attempt to minimize their impact on the environment? *Pacific Tourism Review, 3(1)*, 61-69.

Howenstine, E. (1993). Market segmentation for recycling. *Environment and Behavior, 25(1)*, 86-102.

Hrubes, D., Ajzen, I., & Daigle, J. (2001). Predicting hunting intentions and behavior: An application of the theory of planned behavior. *Leisure Sciences, 23(3)*, 165-178.

Hughes, T.P., Graham, N.A.J., Jackson, J.B.C., Mumby, P.J., & Steneck, R.S. (2010). Rising to the challenge of sustaining coral reef resilience. *Trends in Ecology & Evolution, 25(11)*, 633-642.

Hungerford, H.R., & Volk, T.L. (1990). Changing learner behavior through environmental education. *Journal of Environmental Education, 21(3)*, 8-21.

Inglis, G.J., Johnson, V.I., & Ponte, F. (1999). Crowding norms in marine settings: a case study of snorkeling on the Great Barrier Reef. *Environmental management, 24(3)*, 369-381.

Jacobson, S.K. (1990). A model for using a developing country's park system for conservation education. *Journal of Environmental Education, 22(1)*, 19-25.

Jacobson, S.K. (1991). Evaluation model for developing, implementing, and assessing conservation education programs: examples from Belize and Costa Rica. *Environmental Management, 15(2)*, 143-150.

Jacobson, S.K, & Marynowski, S.B. (1997). Public attitudes and knowledge about ecosystem management on Department of Defense land in Florida. *Conservation Biology, 11(3)*, 770-781.

Johansen, K.M., & Koster, R.L. (2012). Forming Scuba Diving Environmental Codes of Conduct: What Entry-level Divers are Taught in Their First Certification Course. *Tourism in Marine Environments, 8(1-2)*, 1-2.

Juanes, F. (2001). Mediterranean marine protected areas. *Trends in Ecology & Evolution, 16(4)*, 169-170.

Kerr, L. (1991). Ducks don't vote: The dilemma of wildland wildlife managers. *Trends, 28(2)*, 30-34.

Kimmel, J.R. (1999). Ecotourism as environmental learning. *Journal of Environmental Education, 30(2)*, 40-44.

Kirchler, E., & Davis, J.H. (1986). The influence of member status differences and task type on group consensus and member position change. *Journal of Personality and Social Psychology, 51(1)*, 83-91.

Kler, B.K., & Tribe, J. (2012). Flourishing through SCUBA: Understanding the pursuit of dive experiences. *Tourism in Marine Environments, 8(1-2)*, 1-2.

Leujak, W., & Ormond, R.F.G. (2007). Visitor perceptions and the shifting social carrying capacity of South Sinai's coral reefs. *Environmental Management, 39(4)*, 472-489.

Leung, Y.F., & Marion, J.L. (2000). Recreation impacts and management in wilderness: A state-of-knowledge review. *Proceedings: Wilderness science in a time of change, 5*, 23-27.

Liddle, M.J., & Kay, A.M. (1987). Resistance, survival and recovery of trampled corals on the Great Barrier Reef. *Biological Conservation, 42(1)*, 1-18.

Lindgren, A., Palmlund, J., Wate, I., & Gössling, S. (2008*). Environmental management and education: the case of PADI.* In B. Garrod & S. Gössling (Eds.), *New Frontiers in Marine Tourism: Diving Experiences, Sustainability, Management* (pp.115-136). Amsterdam: Elsevier.

Littlefair, C.J. (2003). *The effectiveness of interpretation in reducing the impacts of visitors in national parks*. PhD thesis, Griffith University.

Lockwood, M., Worboys, G.L., & Kothari, A. (2006). *Managing protected areas: a global guide*. UK: Earthscan.

Lucas, R.C. (1979). *Perceptions of non-motorized recreational impacts: A review of research findings*. Recreational Impacts on Wildlands. USDA Forest Service, USDI National Park Service, 6-001.

Luck, M. (2003). Education on marine mammal tours as agent for conservation, but do tourists want to be educated? *Ocean & Coastal Management, 46*, 943-956.

Lucrezi, S., Saayman, M., & Van Der Merwe, P. (2013). Perceived Diving Impacts and Management Implications at a Popular South African Reef. *Coastal Management, 41(5)*, 381-400.

Lucrezi, S., Saayman, M., & van der Merwe, P. (2013). Managing diving impacts on reef ecosystems: Analysis of putative influences of motivations, marine life preferences and experience on divers' environmental perceptions. *Ocean & Coastal Management, 76*, 52-63.

Luna, B., Perez, C.V., & Sanchez-Lizaso, J.L. (2009). Benthic impacts of recreational divers in a Mediterranean Marine Protected Area. *ICES Journal of Marine Science, 66(3),* 517-523.

Madin, E.M.P., & Fenton, D.M. (2004). Environmental interpretation in the Great Barrier Reef Marine Park: an assessment of programme effectiveness. *Journal of Sustainable Tourism, 12(2),* 121-137.

Manfredo, M.J., & Bright, A.D. (1991). A model for assessing the effects of communication on recreationists. *Journal of Leisure Research, 23(1),* 1-20.

Manfredo, M.J., & Fishbein, M. (1992). *Influencing human behavior: Theory and applications in recreation, tourism, and natural resources management*. Champaign, Illinois: Sagamore Publishing.

Manfredo, M.J., Yuan, S.M., & McGuire, F.A. (1992). The influence of attitude accessibility on attitude-behavior relationships: Implications for recreation research. *Journal of Leisure Research, 24(2)*, 157-170.

Manning, R.E. (2003). Emerging principles for using information/education in wilderness management. *International Journal of Wilderness, 9(1)*, 20-27.

Marion, J.L., & Reid, S.E. (2007). Minimising visitor impacts to protected areas: The efficacy of low impact education programmes. *Journal of Sustainable Tourism, 15(1),* 5-27.

Marion, J.L., & Rogers, C.S. (1994). The applicability of terrestrial visitor impact management strategies to the protection of coral reefs. *Ocean & Coastal Management, 22(2)*, 153-163.

Mayes, G., Dyer, P., Richins, H., Black, R., & Weiler, B. (2004). Dolphin-human interaction: changing pro-environmental attitudes, beliefs, behaviours and intended actions of participants through management and interpretation programs. *Annals of Leisure Research, 7(1)*, 34-53.

Mayes, G., & Richins, H. (2008). Dolphin Watch Tourism: Two Differing Examples of Sustainable Practices and Proenvironmental Outcomes. *Tourism in Marine Environments, 5, (2-3)*, 201-214.

McArthur, S. (1994). Acknowledging a Symbiotic Relationship-better heritage management via better visitor management. *Australian Parks and Recreation, 30(3)*, 12-17.

McClanahan, T.R., & Mangi, S. (2001). The effect of a closed area and beach seine exclusion on coral reef fish catches. *Fisheries Management and Ecology, 8(2)*, 107-121.

McClanahan, T.R., Mwaguni, S., & Muthiga, N.A. (2005). Management of the Kenyan coast. *Ocean and Coastal Management, 48(11-12)*, 901-931.

McClanahan, T.R. (1994). Kenyan coral reef lagoon fish: effects of fishing, substrate complexity, and sea urchins. *Coral Reefs, 13(4)*, 231-241.

McKenzie-Mohr, D. (2000). New ways to promote proenvironmental behavior: promoting sustainable behavior: an introduction to community-based social marketing. *Journal of Social Issues, Promoting Environmentalism, 56(3)*, 543-554.

Medio, D., Ormond, R.F.G., & Pearson, M. (1997). Effect of briefings on rates of damage to corals by scuba divers. *Biological Conservation, 79(1)*, 91-95.

Moscardo, G. (1996). Mindful visitors heritage and tourism. *Annals of Tourism Research, 23(2)*, 376-397.

Moscardo, G. (1998). Interpretation and sustainable tourism: Functions, examples and principles. *Journal of Tourism Studies, 9*, 2-13.

Moscardo, G. (1999). *Making visitors mindful*. Champaign, Illinios: Sagamore Publishing.

Moscardo, G., & Pearce, P.L. (1986). Visitor centres and environmental interpretation: An exploration of the relationships among visitor enjoyment, understanding and mindfulness. *Journal of Environmental Psychology, 6(1),* 89-108.

Moscardo, G., Woods, B., & Saltzer, R. (2004). *The role of interpretation in wildlife tourism*. In K. Higginbottom (Ed.), *Wildlife Tourism: Impacts, Planning and Management* (pp. 231-251). Altona: Common Ground Publishing.

Moskwa, E.C. (2012). Exploring place attachment: an underwater perspective. *Tourism in Marine Environments, 8(1-2),* 1-2.

Musa, G. (2002). Sipadan: a SCUBA-diving paradise: an analysis of tourism impact, diver satisfaction and tourism management. *Tourism Geographies, 4(2),* 195-209.

Musa, G., Latifah, S., & Lee, L. (2006). Layang Layang: An empirical study on SCUBA divers' satisfaction. *Tourism in Marine Environments, 2(2),* 89-102.

Musa, G., Seng, W.T., Thirumoorthi, T., & Abessi, M. (2011). The influence of scuba divers' personality, experience, and demographic profile on their underwater behavior. *Tourism in Marine Environments, 7(1),* 1-14.

Needham, M.D. (2010). Value orientations toward coral reefs in recreation and tourism settings: a conceptual and measurement approach. *Journal of Sustainable Tourism, 18(6),* 757-772.

Newhouse, N. (1990). Implications of attitude and behavior research for environmental conservation. *Journal of Environmental Education, 22(1),* 26-32.

O'Brien, T. (2000). *The Galapagos conservation fund: A case study in developing an organized communication strategy*. New York: Lindblad Expeditions.

Olson, E.C. (1984). Interpretation and Nonformal Environmental Education in Natural Resources Management. *Journal of Environmental Education, 15(4),* 6-10.

Ong, T.F., & Musa, G. (2012). Examining the influences of experience, personality and attitude on SCUBA divers' underwater behaviour: A structural equation model. *Tourism Management, 33(6),* 1521-1534.

Orams, M.B. (1994). Creating effective interpretation for managing interaction between tourists and wildlife. *Australian Journal of Environmental Education, 10(1)*, 21-34.

Orams, M.B. (1995). Towards a more desirable form of ecotourism. *Tourism Management, 16(1),* 3-8.

Orams, M.B. (1996). Using interpretation to manage nature-based tourism. *Journal of Sustainable Tourism, 4(2)*, 81-94.

Orams, M.B. (1996). A conceptual model of tourist-wildlife interaction: the case for education as a management strategy. *Australian Geographer, 27(1)*, 39-51.

Orams, M.B. (1997). The effectiveness of environmental education: can we turn tourists into 'greenies'? *Progress in Tourism and Hospitality Research, 3*, 295-306.

Orams, M.B. (2000). Tourists getting close to whales, is it what whale-watching is all about? *Tourism Management, 21*, 561-569.

Orams, M.B. (2002). Feeding wildlife as a tourism attraction: a review of issues and impacts. *Tourism Management, 23(3),* 281-293.

Orams, M.B, & Hill, G.J.E. (1998). Controlling the ecotourist in a wild dolphin feeding program: is education the answer? *Journal of Environmental Education, 29(3),* 33-38.

Packer, J. (2006). Learning for fun: The unique contribution of educational leisure experiences. *Curator: The Museum Journal, 49(3),* 329-344.

PADI. (2012). *PADI Instructor Manual* (D. Richardson Ed.). California: Professional Association of Diving Instructors.

Pastorelli, J. (1998). *Creative Interpretation Techniques*. Paper presented at the Ecotourism Association of Australia National Conference 1997, New South Wales, Australia.

Pepe, S.L. (2010). *Caution diver below! A case for enhanced environmental education and policies to raise awareness of sustainable scuba diving*. Masters thesis, Empire State College, New York.

Petty, R.E., & Cacioppo, J.T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer.

Petty, R.E., McMichael, S., & Brannon, L. (1992). *The elaboration likelihood model of persuasion: applications in recreation and tourism*. In M. Manfredo & M. Fishbein (Eds.), *Influencing human behavior* (pp. 77-101). Champaign, Illinois: Sagamore Publishing.

Plathong, S., Inglis, G.J., & Huber, M.E. (2000). Effects of self-guided snorkeling trails on corals in a tropical marine park. *Conservation Biology, 14(6)*, 1821-1830.

Pomeroy, R.S., Parks, J.E., & Watson, L.M. (2004). *How is Your MPA Doing?: A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness*. Gland, Switzerland: World Conservation Union.

Powell, R.B., & Ham, S. (2008). Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behaviour? Evidence from the Galapagos Islands. *Journal of Sustainable Tourism, 16(4)*, 467-489.

Ransom, K.P., & Mangi, S.C. (2010). Valuing recreational benefits of coral reefs: the case of mombasa marine national park and reserve, Kenya. *Environmental management, 45(1)*, 145-154.

Reilly, M.D., & Conover, H.N. (1983). Meta analysis: integrating results from consumer research studies. *Advances in Consumer Research, 10*, 509-513.

Roberts, C.M., Bohnsack, J.A., Gell, F., Hawkins, J.P., & Goodridge, R. (2001). Effects of marine reserves on adjacent fisheries. *Science, 294(5548)*, 1920.

Robertson, R.D. (1986). *Actual versus self-reported wilderness visitor behavior.* General Technical Report, Intermountain Research Station, USDA Forest Service (INT-212), 326-332.

Roggenbuck, J.W. (1992). *Use of persuasion to reduce resource impacts and visitor conflicts.* In M. Manfredo & M. Fishbein (Eds.), *Influencing Human Behavior: theory and applications in recreation, tourism, and natural resources management* (pp. 149-208). Champaign, Illinois: Sagamore Publishing

Roggenbuck, J.W., Williams, D.R., & Watson, A.E. (1993). Defining acceptable conditions in wilderness. *Environmental Management*, *17(2)*, 187-197.

Rouphael, A.B., & Inglis, G.J. (1997). Impacts of recreational scuba diving at sites with different reef topographies. *Biological Conservation, 82(3)*, 329-336.

Russ, G.R., & Alcala, A.C. (1996). Do marine reserves export adult fish biomass? Evidence from Apo Island, central Philippines. *Marine Ecology Progress Series*, *132*, 1-9.

Russ, G.R., Alcala, A.C., & Maypa, A.P. (2003). Spillover from marine reserves: the case of Naso vlamingii at Apo Island, the Philippines. *Marine Ecology Progress Series, 264*, 15-20.

Salm, R.V. (1986). Coral reefs and tourist carrying capacity: the Indian Ocean experience. *Industry and Environment, 9(1)*, 11-13.

Schultz, P.W., Nolan, J.M., Cialdini, R.B., Goldstein, N.J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science, 18(5)*, 429-434.

Schwartz, S.H. (1977). *Normative influences on altruism*. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 221-279). New York: Academic Press.

Scott, D., & Willits, F.K. (1994). Environmental attitudes and behavior. *Environment and Behavior, 26(2)*, 239-260.

Scott-Ireton, Della. (2008). Teaching ‘heritage awareness’ rather than ‘skills’ to sports diving community. *Journal of Maritime Archaeology, 3(2)*, 119-120.

Shafer, C.S., & Hammitt, W.E. (1995). Congruency among experience dimensions, condition indicators, and coping behaviors in wilderness. *Leisure Sciences, 17(4)*, 263-279.

Shafer, C.S., & Inglis, G.J. (2000). Influence of social, biophysical, and managerial conditions on tourism experiences within the Great Barrier Reef World Heritage Area. *Environmental Management*, *26(1)*, 73-87.

Shafer, C.S., Inglis, G.J., Johnson, V.Y., & Marshall, N.A. (1998). *Visitor experiences and perceived conditions on day trips to the Great Barrier Reef.* CRC Reef Research Centre Technical Report No. 21 (pp. 76 pp.). Townsville: CRC Reef Research Centre.

Sheeran, P., & Orbell, S. (1998). Do intentions predict condom use? Meta analysis and examination of six moderator variables. *British Journal of Social Psychology, 37(2)*, 231-250.

Skanavis, C., & Giannoulis, C. (2009). A training model for environmental educators and interpreters employed in Greek protected areas and ecotourism settings. *International Journal of Sustainable Development & World Ecology, 16(3)*, 164-176.

Society for Interpreting Britain's Heritage. (1998). Interpreting Britain. *Interpretation*, *3(2)*, 27.

Stern, P.C. (1999). Information, incentives, and proenvironmental consumer behavior. *Journal of Consumer Policy, 22(4)*, 461-478.

Stern, P.C. (2005). Understanding individuals' environmentally significant behavior. *Environmental Law Reporter News and Analysis, 35(11)*, 10785.

Stern, P.C, Dietz, T., Abel, T., Guagnano, G.A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Book Review Co-Editor International Editor Book Review Co-Editor, 6(2)*, 81.

Swannell, J. (Ed.) (1983). *The little oxford dictionary of current English*. New York: Oxford University Press.

Szuster, B.W., Needham, M.D., & McClure, B.P. (2011). Scuba diver perceptions and evaluations of crowding underwater. *Tourism in Marine Environments, 7(3-4)*, 3-4.

Talge, H. 1992. *Impact of recreational divers on Scleractinian Corals at Looe Key, Florida*. In: Proceedings of the Seventh International Coral Reef Symposium, Guam, 1992, vol. 2, pp. 1077–1082.

Tanner, C. (1999). Constraints on environmental behaviour. *Journal of Environmental Psychology, 19(2)*, 145-157.

Taylor, S., & Todd, P. (1997). Understanding the determinants of consumer composting behavior. *Journal of Applied Social Psychology, 27*, 602-628.

Thapa, B., Graefe, A.R., & Meyer, L.A. (2005). Moderator and mediator effects of scuba diving specialization on marine-based environmental knowledge-behavior contingency. *The Journal of Environmental Education*, *37(1)*, 53-67.

Thogersen, J. (1999). The ethical consumer. Moral norms and packaging choice. *Journal of Consumer Policy, 22(4)*, 439-460.

Thogersen, J, & Aarhus, D. (2007). *The motivational roots of norms for environmentally responsible behaviour*. Paper presented at the Proceedings of the Nordic Consumer Policy Research Conference 2007.

Tilden, F. (1977). *Interpreting our heritage*. Chapel Hill: University of North Carolina Press.

Tilden, F. (1977). *Interpreting our heritage* (3rd ed.). Chapel Hill: University of North Carolina Press.

Townsend, C. (2008). *Interpretation and environmental education as conservation tools*. In B. Garrod, & S. Gössling (Eds.) *New frontiers in marine tourism: Diving experiences, sustainability, management* (pp. 189-200). Amsterdam: Elsevier

Tratalos, J.A., & Austin, T.J. (2001). Impacts of recreational SCUBA diving on coral communities of the Caribbean island of Grand Cayman. *Biological Conservation, 102(1)*, 67-75.

Triandis, H.C. (1977). *Interpersonal behaviour.* Monterey, Ca: Brooks/Cole Pub. Co.

Uyarra, M.C., Watkinson, A.R., & Côté, I.M. (2009). Managing dive tourism for the sustainable use of coral reefs: Validating diver perceptions of attractive site features. *Environmental management, 43(1)*, 1-16.

Veal, A.J. (2006). *Research methods for leisure and tourism: A practical guide* (3rd ed.). Harlow, Essex: Pearson Education.

Vincent, M., & Fazio, R. (1992). *Attitude accessibility and its consequences for judgement and behavior*. In M. Manfredo & M. Fishbein (Eds.), *Influencing Human Behavior: theory and applications in recreation, tourism, and natural resources management* (pp. 51-76). Illinois: Sagamore Publishing Co. Inc.

Walters, R.D.M, & Samways, M.J. (2001). Sustainable dive ecotourism on a South African coral reef. *Biodiversity & Conservation, 10(12)*, 2167-2179.

Watson, A., & Roggenbuck, J. (1998). Selecting human experience indicators for wilderness: different approaches provide different results. *Wilderness & natural areas in eastern North America: research, management and planning. Nacogdoches, TX: Stephen F. Austin State University, Arthur Temple College of Forestry, Center for Applied Studies*, 264-269.

Wearing, S., Edinborough, P., Hodgson, L., & Frew, E. (2008). *Enhancing Visitor Experience through Interpretation: An Examination of Influencing Factors.* QLD: CRC for Sustainable Tourism.

Weiler, B. (1999). Assessing the Interpretation Competencies of Ecotour Guides. *Journal of Interpretation Research, 4(1)*, 80-83.

Weiler, B., & Davis, D. (1993). An exploratory investigation into the roles of the nature-based tour leader. *Tourism Management, 14*, 91-91.

Weiler, B., & Ham, S. (2001). Tour guides and interpretation. *Encyclopedia of Ecotourism*, 549-563.

Weiler, B., & Ham, S. (2002). Tour guide training: A model for sustainable capacity building in developing countries. *Journal of Sustainable Tourism, 10(1)*, 52-69.

Wicker, A.W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues, 25(4)*, 41-78.

Wicker, A.W. (1971). An examination of the" other variables" explanation of attitude-behavior inconsistency. *Journal of Personality and Social Psychology, 19(1)*, 18.

Wilkinson, C.R. (1996). Global change and coral reefs: impacts on reefs, economies and human cultures. *Global Change Biology, 2(6)*, 547-558.

Woodland, D.J., & Hooper, J.N.A. (1977). The effect of human trampling on coral reefs. *Biological Conservation, 11(1),* 1-4.

Woods, B. (2000). Beauty and the beast: Preferences for animals in Australia. *The Journal of Tourism Studies (Australia), 11(2)*, 25-35.

Worachananant, S., Carter, RW, Hockings, Marc, & Reopanichkul, Pasinee. (2008). Managing the Impacts of Scuba divers on Thailand's coral reefs. *Journal of Sustainable Tourism, 16(6),* 645-663.

Wu, C., & Shaffer, D.R. (1987). Susceptibility to persuasive appeals as a function of source credibility and prior experience with the attitude object. *Journal of Personality and Social Psychology, 52(4),* 677-688.

Young, J., & Temperton, J. (2008). *Measuring community attitudes and awareness towards the Great Barrier Reef 2007*. Research Publication, 90. QLD: GBRMPA.

Young, S., & Loomis, D. (2010). *Diver perceptions of Florida Keys Reef conditions by specialization level*. Paper presented at the Proceedings of the 2009 Northeastern Recreation Research Symposium. General Technical Report No. NRS-P-66. USDA Forest Service, Northeastern Research Station, Newton Square, PA.

Zakai, D., & Chadwick-Furman, N.E. (2002). Impacts of intensive recreational diving on reef corals at Eilat, northern Red Sea. *Biological Conservation, 105(2)*, 179-187.

Zelezny, L.C. (1999). Educational interventions that improve environmental behaviors: a meta-analysis. *Journal of Environmental Education, 31(1),* 5-14.

Zeppel, H. (2008). Education and Conservation Benefits of Marine Wildlife Tours: Developing Free-Choice Learning Experiences. *The Journal of Environmental Education, 39(3),* 3-18.

Zeppel, H., & Muloin, S. (2008). Conservation and education benefits of interpretation on Marine Wildlife Tours. *Tourism in Marine Environments, 5, 2(3)*, 215-227.

Appendix

Appendix 1: The Sea Through the Looking Glass - An Interpretive Workshop for Snorkel Operators in the Mombasa Marine Park and Reserve, Kenya

Sander D. den Haring[1,2]

[1] James Cook University, School for Earth and Environmental Sciences, Townsville, Australia

[2] CORDIO East Africa, #9 Kibaki Flats, Kenyatta Beach, Bamburi, P.O.BOX 10135 Mombasa 80101, Kenya

Abstract

Natural resources are enjoyed by a multitude of resource users in an abundance of different manners. This resource use creates impacts on resources and therefore these resources and/or resource users must be managed. Interpretation is one tool often employed to assist with the management of visitors throughout resource use activities. Interpretation programs can be used to influence the behavior of visitors to make their behavior more pro-environmental. Interpretation is a process that uses information to make recipients aware of the meanings and relationships between various components of the environment and themselves. Interpretation relies on information but also includes the opportunity resource users are given to use their knowledge and guidance in applying this knowledge. An effective interpretation program, containing all the previously mentioned aspects, can be created and delivered to visitors in an attempt to influence their behavior accordingly. This research project examined the strengths and weaknesses of various interpretation projects, researched the key ingredients to effective interpretation and created an interpretation program designed specifically for snorkelers of the Mombasa Marine Park and Reserve. The aim of this interpretive program was to influence the behavior of visitors into more pro-environmental behavior (thereby conserving the marine environment), enhancing clientele satisfaction of the snorkel industry and to build sustainability of the snorkel industry in the Mombasa Marine Park and Reserve. An interpretive workshop was used to establish interpretive programs on snorkel boats. The workshop used expert presentations, group discussions and role-play scenarios to transfer the interpretive teachings of the workshop to snorkel industry members. The program was widely welcomed by all members of the snorkel industry. A code of conduct created by the members of the snorkel industry was one of the outputs of the workshop. Materials to be used during interpretive efforts were also made available to the snorkel boats; however, one challenge this program faced was ensuring that the snorkel boats continued to use these materials.

Introduction

Natural resources are used by numerous user groups in a multitude of manners (Hammitt and Cole, 1998). This usage can stem from a recreational, sport, challenge, excitement or socialization nature and activities could include: camping, hiking, fishing, vehicle motoring, snorkeling, and scuba diving to name but a few (Orams, 2000). Any resource use, regardless how minimal the usage is, can lead to negative impacts on that resource (Leung and Marion, 2000, Madin and Fenton, 2004, Marion and Reid, 2007). These resources can suffer as a result of this resource use and therefore it is paramount that these resources and/or resource users be managed (Marion and Rogers, 1994, Hammitt and Cole, 1998).

The Snorkel Industry in the Mombasa Marine Park and Reserve

Snorkel excursions are a popular recreational pastime along the Kenyan coastline. In the Mombasa Marine Park and Reserve alone there are approximately 30 active snorkel boats at any one time. Each snorkel boat can have up to three crew associated with it. Each of these snorkel boats has a capacity of 15-30 passengers and the boats frequent one of three destinations for their daily excursions that include snorkeling. There is no code of conduct governing these snorkel excursions other than the rules and regulations of the Mombasa Marine Park and Reserve and, unfortunately, resources to enforce these rules are often lacking. The lack of enforceable rules results in excessive fish feeding of non-natural dietary foods, damage to corals as passengers touch, walk on and/or break corals, and overcrowding of the destinations frequented by snorkel boats. Previous research exploring the behavior of snorkelers during these snorkel excursions has revealed that snorkelers, and snorkel guides, make frequent contacts with the reef substrate (*Chapter 2*: den Haring 2014). Furthermore, the passengers are often not presented with a briefing, and any transfer of knowledge or information is lacking. Essentially, the snorkel boats currently act as modes of transportation only, rather than educative excursions. There is great potential for these snorkel boat excursions to offer more. The main conclusion of this study indicated that these contacts are misguided and require direction towards more utilization of dead substrate and seagrass substrate (fewer damaging contacts with the substrate).

One method of managing these resources is to influence the behavior of visitors so that it is less damaging to the environment. Interpretation is a tool that can be used to bring about behavior change (Mayes and Richins, 2008, Skanavis and Giannoulis, 2009, Ballantyne and Packer, 2005). Interpretation is the process of conveying a message to someone so that that person gains a better understanding of the issue at hand. This paper describes how interpretive efforts were brought about in the Mombasa Marine Park and Reserve to create more pro-environmental snorkeling behavior and reduce damaging contacts with the reef substrate. The next section provides a more detailed description of effective interpretation.

Theoretical Framework

Interpretation

The process of interpretation is designed to make the recipient aware of meanings and relationships between them and the natural environment, and also stimulate interest and enthusiasm (Moscardo and Pearce, 1986, Luck, 2003). Interpretation often includes first-hand experiences with natural environments (Zeppel, 2008), and it, "assists the visitor to appreciate the area" (Weiler and Davis 1993, quoted in Luck 2003 p.943). The most commonly used definition of interpretation is one developed by Tilden (1957):

> an educational activity which aims to reveal meanings and relationships through the use of original objects, by first hand experience, and by illustrative media, rather than simply to communicate factual information (p. 8).

Interpretation has been called the "key to ensuring the quality of the tourism experience" (Moscardo 1996, p. 376). Interpretation programs use a variety of methods to get a message across to an audience (signs, trails, brochures, guides and visitor centers) (Zeppel, 2008). Interpretation programs seek to stimulate interest, promote learning, guide visitors in appropriate behavior, and encourage enjoyment. Interpretation programs that include all these characteristics can influence visitor attitudes and behavior, and result in changes to both (Roggenbuck, 1992, Luck, 2003, Moscardo et al., 2004, Mayes and Richins, 2008, Zeppel, 2008). The resultant influence of successful interpretation can then have one of three outcomes: change existing attitudes, reinforce existing attitudes or create a new attitude towards a particular behavior (Ham, 2007). Interpretation programs have also been shown to increase enjoyment (Moscardo, 1998, Orams, 1996b).

Interpretation includes the delivery of information, however, information alone is not enough to prompt behavior change. The assumption that the provision of information alone is sufficient to change behavior has been widely disproven by numerous studies (e.g. Hungerford and Volk 1990, Ballantyne and Packer 2005, Stern 2005). Rather, information is one of the necessary components that contribute to effective interpretation (Orams 1996, Moscardo et al. 2004, Ham 2007, Zeppel and Mouloin 2008). Forestell (1993) mentions, "knowledge without behavior leaves no discernable trace of change. In the long run, behavior without knowledge will only last until the next fad" (p. 277). Tilden (1977) states that the aim of interpretation is, "not instruction but provocation" (p. 9), a belief shared by other researchers as well (Moscardo, 1996, Hammitt, 1984, Pastorelli, 1998, Ham, 2007).

Gaps in Current Interpretation Programs

Interpretation programs already exist in numerous (marine) protected areas but few have been evaluated for effectiveness and a need exists for further research into the role that these interpretation programs play (Orams, 1997, Luck, 2003, Pomeroy et al., 2004). Most interpretation programs aimed at changing behavior have been information-based (media advertising and supply of printed materials) and have two underlying assumptions: (1) information will enhance knowledge and influence attitudes resulting in behavior change (widely disproven as outlined earlier) and (2) economic motives (McKenzie-Mohr, 2000). This second assumption refers to a person adopting a changed behavior once it becomes clear that the person can gain financially from the changed behavior (e.g., energy efficient devices such as low-flow showerheads, low-flow toilets). Various case studies have shown that creating economic motives does not necessarily result in changed behavior (McKenzie-Mohr, 2000). Natural resources used by recreational resource users provide enticing opportunities for learning about natural resources. To quote Jacobson (1990): “parks have been called our greatest classrooms without walls” (p. 25) and these classrooms want to be filled (Aiello, 1998, Luck, 2003). However, to be effective, interpretive programs require careful design and implementation. An understanding of the learning process and underlying behavior theory is crucial so that interpretation campaigns can be directed in an effective, enticing and efficient manner (Orams, 1994, Orams, 1997, Tanner, 1999, Darnton, 2008, Orams, 1996b). Educational psychology has been researched thoroughly, however, little of this has been put to use in the environmental interpretation and management field (Orams, 1994) despite its obvious importance (McKenzie-Mohr, 2000).

Aims of this Study

An interpretive workshop, termed ‘The Sea Through the Looking Glass’, was designed to transform ‘transportation-only’ trips into educative excursions aimed at creating more pro-environmental behavior. The workshop was open to all members involved in the snorkel industry in the Mombasa Marine Park and Reserve. This interpretive workshop incorporated an understanding of behavioral theory, interpretation design and local knowledge of the geography (the Mombasa Marine Park and Reserve, and the community) to create a successful program. More specifically, the workshop aimed:

1. To develop what the snorkel excursions already offered (plain excursions) and transform these excursions into environmentally aware excursions.
2. To ensure that these developed excursions become interactive, educative expeditions that result in long-term pro-environmental behavior change by the clients and operators.

3. To promote the sustainability of the excursions.
4. To ensure that the members of the snorkel industry adopt the practices and teachings of the workshop to achieve the previous aims.

The target audiences of the interpretive workshop were all the snorkel operators (large scale and small scale businesses) and associated members within the Mombasa Marine Park and Reserve. Selected members of the park's management authority, the Kenya Wildlife Service (KWS) marine team and customer care department, were also invited to attend to allow more collaboration between KWS and the coastal communities in the future. The goals of the workshop were threefold:

1. To protect and conserve the marine environment of the Mombasa Marine Park and Reserve through the usage of pro-environmental techniques.
2. To enhance the satisfaction of the clientele using the snorkel excursions by transforming the snorkel excursions into interpretive excursions manned by a professional crew.
3. To enhance the small-scale snorkel operations in the Mombasa Marine Park and Reserve.

Methods

Study Site

This training workshop was conducted in the Mombasa Marine Park and Reserve, Kenya (Figure 1). The Mombasa Marine Park and Reserve is located north of Mombasa island and spans nearly 15 kilometers of coastline. The park was legally gazetted in 1986, however legal protection was not enforced until the mid-1990's (McClanahan, 1994). The park and reserve are currently managed by the Kenya Wildlife Service (KWS), under authority of the Ministry of Environment and Natural Resources (McClanahan et al., 2005). The park covers a total of 210 km^2 (200 km^2 for the Reserve and 10 km^2 for the Park). Within the park extractive activities are prohibited, while the reserve tolerates artisanal fishing practices (Ransom and Mangi, 2010). Recreational resource use, such as sailing, scuba diving and snorkeling, is permitted in both the park and reserve. All snorkeling excursions that are included in this study were conducted in the Mombasa Marine Park.

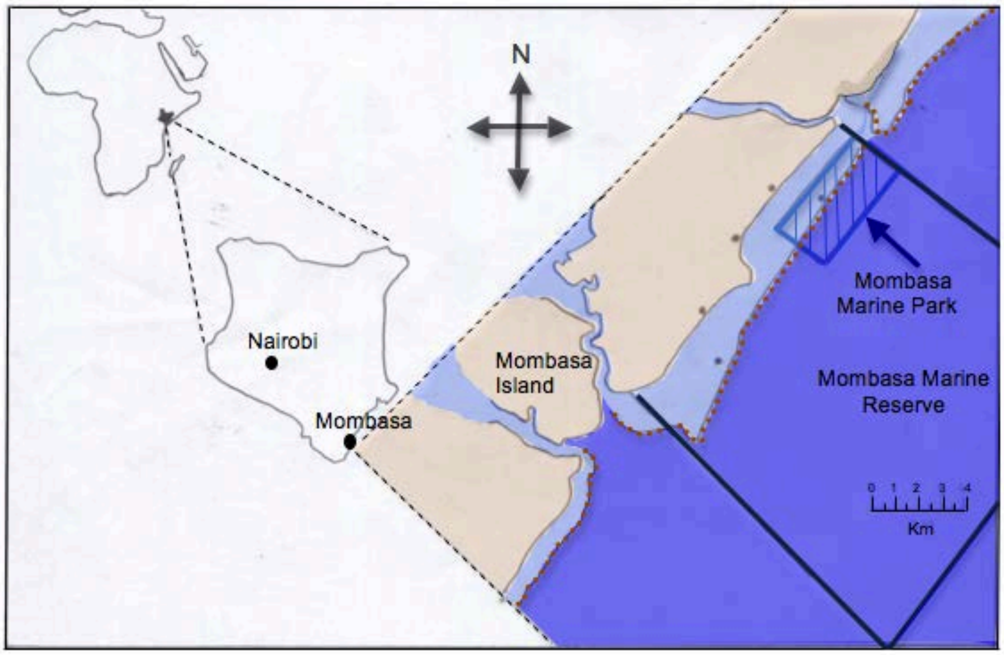


Figure 1. Map of the Mombasa Marine Park and Reserve, Kenya, showing the reserve and park boundaries.

The snorkel excursions in the Mombasa Marine Park and Reserve make use of 'glass bottom' snorkel boats to transport people from the beach to the reef. Most of these operations are locally owned and are small-scale businesses. Usually a single person owns a 'glass bottom' boat and uses a crew to supply the snorkel excursion. Often times the owner of the boat is not involved in the snorkeling excursion and exists only to collect a daily amount of revenue from the crew, resulting in poor maintenance of the snorkel boat and the utilization of sub-standard snorkeling equipment. The crew does not have the resources to supply quality equipment nor to properly maintain the boat. There is also no incentive for the crew to invest in equipment or maintenance, as they have no ownership in the boat. There are also some snorkel excursions that are offered by some of the hotels along the coastline of the Mombasa Marine Park and Reserve. The businesses that supply the snorkel excursions for these hotels are usually bigger and better financed than the 'one-man shows' described above. These businesses can afford to invest in boat maintenance and quality snorkel equipment. These businesses have a definite advantage over the 'one-man shows'.

All snorkeling excursions that are included in this study were conducted in the Mombasa Marine Park. The snorkeling excursions only frequented patch reefs within the lagoon of the park. Bamburi Coral Garden (Figure 2) is a lagoon patch reef visited by snorkel operators as part of their excursion. The site has a maximum depth of 7m within the middle of an ovular area that shallows out to a depth of 1m around the edges. This core area has a length of ~50m and a width of ~30m. This core area, and the surrounding ~40m in all directions (depth range is 0.5-1.5m), is where the snorkeling activities occur. The area labeled as the 'Reef Walk Area' in Figure 2 is an area visited by all snorkeling excursions when permitted by the tide. At low tide this reef flat is exposed and clients of the snorkeling boats venture on a guided walk on this reef flat. Occasionally these snorkeling boats also frequent additional patch reefs for more snorkeling activities (Starfish ~50x40m, 1-1.5m depth range; Severin Bommies ~70x40m, 1.5-2.5m depth range). Within the Mombasa Marine Park and Reserve there are 5 main departure points for the snorkel boats that provide the snorkeling excursions (Figure 2). One of these departure points, located in the southern part of the Reserve does not frequent the sites described above but rather frequents only areas in the southern reserve. The boats (only two boats) operating from this departure point were not included in this study. At any moment there are ~25-30 snorkel boats operating within the Mombasa Marine Park and Reserve depending on any ongoing maintenance.

Figure 2. Map of the Mombasa Marine Park showing the snorkeling and scuba diving locations (from Google Earth).

Overview of the training Workshop

The delivery of this training workshop was realized for groups of approximately 50 participants at a time. The training workshop consisted of expert presentations, group discussions and role-play scenarios. Each of these components was created based on salient beliefs identified in previous research (*Chapter 3*: den Haring 2014). This research monitored snorkelers during their snorkeling activity and identified those snorkelers that did contact the reef and those that did not contact the reef during the snorkeling activity. The individual snorkelers of the two groups were then presented with an elicitation interview to gather the most common beliefs snorkelers have about not contacting the reef substrate. The differences between the two groups were analyzed to arrive at the short-listed salient beliefs depicted in Table 1. Figure 3 shows some of these salient beliefs incorporated into the flip chart (materials are explained in detail below). The expert presentations delivered factual knowledge and included examples of how various methods of information transfer could be used in different settings. The topics that the expert presentations covered were: 1) Lagoon Ecosystem, 2) Reef Ecosystem, 3) Sales, Marketing and Hospitality, 4) Snorkel Techniques and Guiding, 5) Mombasa Marine Park and Reserve, and, 6) How to use the Interpretive Materials. Experts in their respective fields delivered these presentations.

Table 1. Salient beliefs of snorkelers in the Mombasa Marine Park, Kenya (den Haring, 2014).

Salient Belief	Type of Belief
Reef Protection is an advantage when not contacting the living reef	Behavioral belief
Guides would approve of me not contacting the living reef	Injunctive belief
Guides would disapprove of me not contacting the living reef	Injunctive belief
Guides are most likely not to contact the reef	Descriptive belief
Deeper water would make it easier not to contact the living reef	Control belief
More information would make it easier not to contact the living reef	Control belief

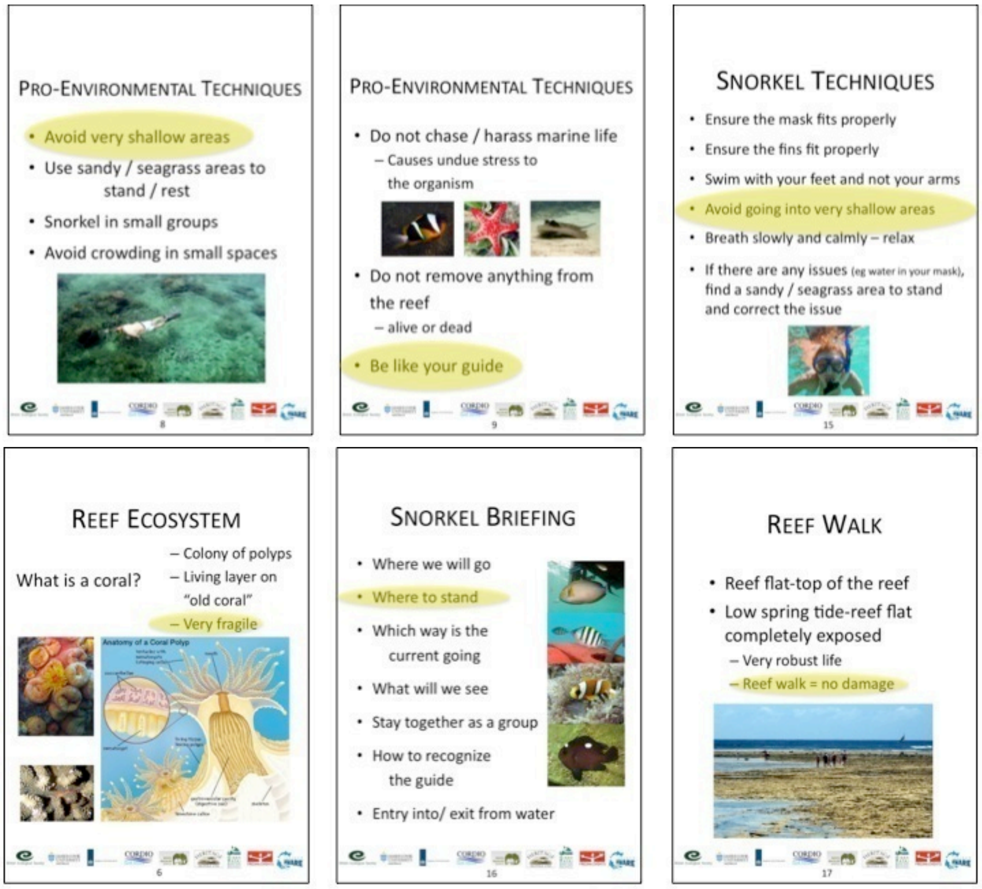


Figure 3. Salient beliefs were targeted in the workshop presentations, group discussions and materials. The images in this figure are from the flip chart that snorkel guides present to their snorkeling clients. Sides 8 and 15 of the flip chart target the belief that deeper water (avoiding shallow water) makes it easier not to contact the reef substrate. Side 9 informs the snorkelers that they should be like their guide. This likeness addresses the fact that the clients believe the guide is the one who approves of them not contacting the reef and that they believe the guide is also the one most likely to not contact the reef. The final three sides (6, 16 and 17) explain that coral reefs are fragile and easily damaged. These messages explain where to stand and that certain activities do not damage the coral reef.

Throughout the workshop discussion groups were used to share and discuss information with participants. The discussion groups were focused around a presentation that provided some background information and then continued by posing questions for the group to discuss and answer. Participants were divided into groups of 10-15 people to continue the discussion and arrive at answers and/or solutions. Every participant was stimulated to contribute to the discussion in answering the questions. A group facilitator, and several other trainers were present to guide the group and maintain the focus of the question. An effort was made to ensure that all topics discussed linked to all the other topics and how these topics were applicable to the Mombasa Marine Park and Reserve. The topics that the discussion groups covered were: 1) Environmental Impacts, 2) Pro-environmental Techniques, 3) Development of Code of Conduct, and, 4) Threats and Conservation in the Mombasa Marine Park.

The final day of the workshop was dedicated to implementing the teachings of the previous two days and having the participants take part in role-playing scenarios. These role-playing scenarios started with ‘dry’ practice (on land) and focused on using some of the materials (flip chart and salesman booklet, described in the section below). The flip chart use consisted of delivering a presentation using the flip chart to an audience. The participants were grouped into groups of 6-10 people per group. One participant was then selected to be the interpreter delivering the flip chart presentation. The remaining participants assumed the role of snorkeler on a snorkeling excursion. For the salesman techniques role-play scenario the salesmen of the group were grouped together and one salesman was selected to be a salesman selling a snorkeling excursion to the remaining participants. Realistic objections were incorporated into these role-play scenarios and the salesman was evaluated how he/she overcame and addressed these objections. Throughout these role-play scenarios the trainers were there to guide, evaluate and provide feedback.

The ‘wet’ role-play scenarios consisted of dividing the group of participants evenly over several of the snorkel boats. On each snorkel boat the group was further divided into two groups and the ‘dry’ scenarios re-enacted. The participants again delivered the flip chart presentations but now also had to add in working with the captain of the snorkel boat to achieve an optimum cruising speed for delivery of the flip chart (noise and time till arrival at snorkeling location). Throughout these role-play scenarios the trainers were there to guide, evaluate and provide feedback to the participants.

This workshop had in attendance boat captains, guides, salesmen and boat owners. The bulk of the interpretation that the workshop bestowed on the participants was intended to be delivered by the guides. The best method of interpretation has often been attributed to guides as they deliver a very personal interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Luck, 2003, Aiello, 1998). Guides tend to act as motivators in getting visitors to respect wildlife or adopt pro-environmental practices (Skanavis and Giannoulis, 2009, Zeppel, 2008, Zeppel and Muloin, 2008, Black and Ham, 2005). Furthermore, attributes such as the ability to demonstrate role-model behavior, manage visitor-wildlife interactions and enforce minimal impact behavior make guides properly and best placed to deliver interpretation (Skanavis and Giannoulis, 2009, Moscardo et al., 2004, Littlefair, 2003).

Once the teachings of the training workshop had been implemented within the snorkel industry the researcher accompanied snorkel excursions and documented if the snorkel boat had brought the interpretive materials (flip chart, underwater slate and flag) from the workshop, and if the materials (flip chart and underwater slate) were used throughout the snorkel excursion. Snorkel boats that departed the shore without the researcher onboard were also monitored to see if the materials were brought onboard and if the materials were used throughout the excursion. Due to the absence of the researcher onboard it was not always possible to determine if the materials were present on the boat and if they were used. Occasional interaction of the researcher with the clients and crew of those boats did provide information about the presence of the materials and the use of the materials during the snorkel excursion.

Sample Size

The interpretive training workshop, termed 'The Sea Through the Looking Glass', was able to train 143 participants involved in snorkeling excursions in the Mombasa Marine Park and Reserve, spread throughout three individual workshops. Eleven of these participants were employees of the Kenya Wildlife Service (KWS), the remaining participants consisted of guides, captains, salesmen or boat owners. At the time of the workshop 30 snorkel boats were active in the Mombasa Marine Park and Reserve and all but four of these boats sent delegates to the training workshop. One KWS employee who attended the first training workshop assisted with the remaining two workshops to become a trainer for any future workshops. The dates of the three training workshops were June 2011, June 2011 and May 2012. After implementation of the training workshop the researcher was present on 34 different snorkel excursions.

Materials

The materials of the workshop are described below:

Flipchart - The flipchart consisted of an A3-sized, 20-sided presentation. This flip chart covered information on the Mombasa Marine Park, sea grass beds, coral reefs, common life to be encountered during the excursion, pro-environmental techniques, snorkel techniques, snorkel briefing and the guided reef walk. This flip chart was designed to be delivered to the clients while the snorkel boat motored from the beach towards the coral garden (snorkel location), and again when the boat motored from the coral garden to the reef walk location. An instruction and/or reference booklet was also designed to accompany the flip chart. This booklet was created to help the guides gain confidence in the initial stages of delivering the flip chart presentation to their clients.

Underwater slate - The underwater slate was created for use during any in-water activities. The underwater slate depicted photos of the most common fish, invertebrate and coral species seen in the marine park. Fish were categorized according to size and family.

Salesman booklet - the salesman booklet was created to allow the salesman to conduct sales in a professional manner. The salesman booklet contained information on the logo, or brand, of the ‘new product’ (interpretation), explained what is being offered, the commitment the snorkel members have to their client and the environment, photos of commonly encountered marine organisms, and the code of conduct that was developed during the workshop.

Flags - A flag was designed for use on the individual boats to differentiate them from the snorkel boats that chose not to attend the workshop, and therefore not able to deliver the new valued product (the interpretation).

Participant manuals - Every participant received a participant manual. The participant manual contained every presentation delivered during the workshop as well as some extra information on marine life. This manual was intended to act as a reference guide for the participants after the workshop.

Polo shirts - Polo shirts were designed to act as a uniform that could be worn when conducting snorkel excursion business (selling, guiding, captaining). Each polo shirt had a large logo printed on the backside, and a smaller logo printed on the chest pocket.

Materials bag - A bag was manufactured to accommodate all the materials. This bag was of durable quality and designed to be able to carry the materials to and from the boat and beach.

Signboards - Signboards were created that were scattered along the coastline in the Mombasa Marine Park and Reserve at strategic locations (KWS ticket booths, boat departure areas, areas that attract clients). These signboards depicted the logo of the ‘new product’ on one side and explained what the logo entails (training in responsible tourism, marine conservation, professionalism). The other side of the signboard portrayed the code of conduct, as developed by the participants of the workshop.

Each individual was presented with a certificate of completion upon successfully completing the workshop. This certificate was accompanied with the participant manual and a polo shirt (uniform). Each boat that successfully completed the training workshop was presented with a materials bag that contained: one flip chart, one flip chart manual, two underwater slates, two salesman booklets, two stickers with the logo, one laminated copy of the code of conduct and one flag. Before each boat was handed their materials, they were asked to sign an agreement to maintain and use the materials in an acceptable manner. Should they void this agreement they acknowledged and agreed that KWS can reclaim the materials. KWS carried out spot checks to ensure the materials remained in a good condition and were being used appropriately.

This workshop created a branding theme that the snorkel operators could use to develop their businesses. Each participant (and boat) that successfully completed the training workshop and, implemented the teachings of the workshop, received a logo (Figure 4). This logo is a brand that distinguishes the boat operator from those operators who did not complete the training workshop. This logo and its explanation were advertised on signage boards spread out along the coastline of the Mombasa Marine Park and Reserve. All materials were also branded with this logo. Any future clientele will thus be able to distinguish ‘eco’ operators from ‘non-eco’ operators and be able to identify what these branded operations offer.

Figure 4. The logo of the interpretive workshop. Every participant and boat that successfully completed the training workshop was given this logo to use in their business.

Three months after the first two interpretive training workshops a competition called ‘*The Challenge*’ was initiated in an effort to assist the snorkel operations in utilizing the materials distributed to the snorkel operations upon completion of the workshop. The competition used mini questionnaires (Figure 5) to gather information from clients of the snorkeling excursions regarding the overall excursion. Questionnaires were available in English, French, German and Kiswahili, representing the four most common languages of the clients in the Mombasa Marine Park and Reserve, Kenya. Seven key questions were presented that were scored on a scale of 1-

10 (bad-good) and three questions existed to determine if the crew used the materials of the workshop. These questionnaires were completed by clients upon completion of a snorkeling excursion. This competition lasted three months after which the best scoring boats and crew were awarded prizes donated by the Kenya Wildlife Service.

KENYA WILDLIFE SERVICE

kws ticket office:_________ number: _____

THE CHALLENGE

Date of excursion: ____________ Name of Glass Boat: ______________

# of persons in your group: _____ Name of Crew: ________________

Please circle the score for the following:	BAD									GOOD
1. Appearance of the crew	1	2	3	4	5	6	7	8	9	10
2. Quality of snorkeling equipment	1	2	3	4	5	6	7	8	9	10
3. The manner in which the salesman sold the trip	1	2	3	4	5	6	7	8	9	10
4. The knowledge of the crew about marine life	1	2	3	4	5	6	7	8	9	10
5. Professionalism of the crew	1	2	3	4	5	6	7	8	9	10
6. Value for money for today's excursion	1	2	3	4	5	6	7	8	9	10
7. Rate the trip overall	1	2	3	4	5	6	7	8	9	10

Did you receive a flipchart presentation on your excursion today? YES / NO

Did the crew use the underwater fish ID slates? YES / NO

Did the salesman use a salesman folder to sell the excursion? YES / NO

Figure 5. The mini questionnaire used in '*The Challenge*'.

Results and Discussion

Overall Effect of the Training Workshop

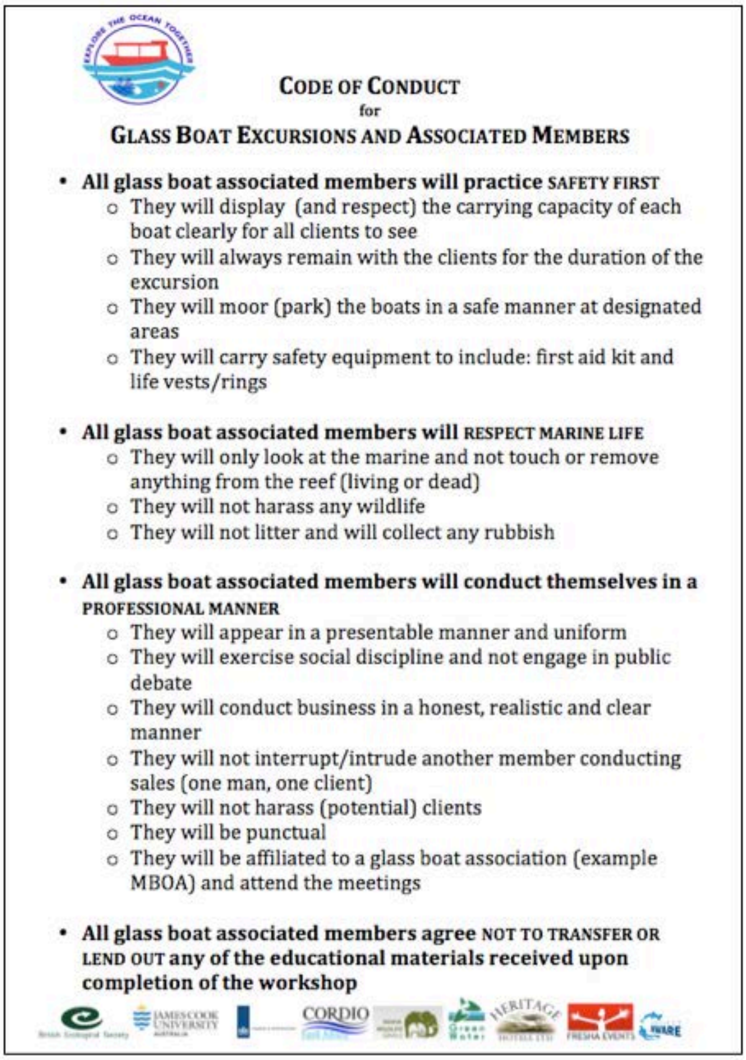
As a result of the interpretive workshop the behavior of the guides and their snorkeling clients was influenced into more environmental-friendly behavior (*Chapter 4*: den Haring 2014). The research that focused on the behavior of the snorkelers and guides before and after the implementation of the training workshop was based on research studies (*Chapter 2 and 3*: den Haring 2014). The snorkel behavior of recreational snorkelers in the Mombasa Marine Park and Reserve was explored in the first study (*Chapter 2*) to determine the extent of (damaging) contacts snorkelers have with the reef during their interactions throughout a snorkel excursion. The second study discovered the salient (or most important beliefs) snorkelers held about not contacting the reef substrate while snorkeling (*Chapter 3*). These beliefs were then incorporated into the training workshop (and materials) as described earlier.

Differences were evident between snorkelers who did not receive interpretation and those who did. The evaluation of the differences between the snorkeling clients before and after the implementation of the teachings of the training workshop was based on monitoring the behavior of snorkelers during in-water observations, and through the use of post-excursion questionnaires (visitor experience)(*Chapter 4*: den Haring 2014). This study found that the clients and guides on these excursions exhibited fewer contacts after the implementation of the interpretive efforts. The contacts made by the clients after the interpretive efforts were implemented included more intentional contacts on dead substrate (compared to before the implementation of the interpretive efforts) and more positive contacts throughout the snorkel excursion. Other observable differences as a result of the interpretive workshop include: guides explaining to other guides (who did not attend the workshop) to replace marine organisms (i.e. starfish, sea cucumbers, sea urchins) back into the water, guides instructing their clients verbally not to stand on the coral while they snorkel, guides pointing out fish during the snorkel excursion and guides observed to be collecting rubbish during the snorkel excursion (pers obs den Haring). These were all behaviors that were absent before the workshop. A sense of professionalism and pride also seems to have been instilled in the members associated with snorkeling excursions in the Mombasa Marine Park and Reserve (pers obs den Haring). One example shows that several boats who attended the training workshop had taken the initiative to display the logo on the bow of their snorkel boat at their own expense.

Visitor experience was also enhanced as a result of the implementation of the teachings of the training workshop (*Chapter 4*: den Haring 2014). More snorkeling clients stated they received a presentation during their snorkel excursion after the implementation of the training workshop and clients were more satisfied with the amount of interaction, use of illustrations and wording of the presentations and/or guided activities after the training workshop. Furthermore, clients on excursions following the implementation of the interpretive efforts stated that the knowledge of their guide added to their enjoyment during the excursion (significantly more after the training workshop compared to before). This last difference between the before- and after-workshop groups could also explain the increased amount of elaboration, or critical thinking, by clients after the workshop of the messages communicated to them via the guide, or presentation, throughout their snorkeling excursion.

One of the main outputs that the training workshop produced was a Code of Conduct for the snorkel excursions and the associated members (Figure 6). Before the creation of this Code of Conduct, background information was presented that covered: Environmental Impacts and Pro-environmental techniques. A presentation that provided detailed information on a code of conduct was also delivered that included: ‘What is a code of conduct’, ‘How does it work’, ‘Why have a code of conduct’, ‘Will it be successful’, and ‘Examples of other Codes of Conduct’. As a group discussion with all participants, the group was asked what they would like to have in their code of conduct. Each suggestion was countered by questions to determine if the snorkel excursions and associated members would be able to conduct the suggestion.

Following that, each suggestion was then also questioned to determine if it would be realistic that all snorkel excursions and associated members conduct this suggestion. This group discussion then provided a skeleton code of conduct. Throughout the remainder of the workshop smaller discussion groups (each group had 6-10 participants) were asked to review and amend the proposed first draft of the code of conduct. This process created a code of conduct that had undergone several drafts by the end of the workshop. The finalized code of conduct is shown in Figure 6.



CODE OF CONDUCT
for
GLASS BOAT EXCURSIONS AND ASSOCIATED MEMBERS

- **All glass boat associated members will practice SAFETY FIRST**
  - They will display (and respect) the carrying capacity of each boat clearly for all clients to see
  - They will always remain with the clients for the duration of the excursion
  - They will moor (park) the boats in a safe manner at designated areas
  - They will carry safety equipment to include: first aid kit and life vests/rings
- **All glass boat associated members will RESPECT MARINE LIFE**
  - They will only look at the marine and not touch or remove anything from the reef (living or dead)
  - They will not harass any wildlife
  - They will not litter and will collect any rubbish
- **All glass boat associated members will conduct themselves in a PROFESSIONAL MANNER**
  - They will appear in a presentable manner and uniform
  - They will exercise social discipline and not engage in public debate
  - They will conduct business in a honest, realistic and clear manner
  - They will not interrupt/intrude another member conducting sales (one man, one client)
  - They will not harass (potential) clients
  - They will be punctual
  - They will be affiliated to a glass boat association (example MBOA) and attend the meetings
- **All glass boat associated members agree NOT TO TRANSFER OR LEND OUT any of the educational materials received upon completion of the workshop**

Figure 6. The finalized code of conduct as decided by the snorkel excursion associated members.

Use of Training Workshop Materials

The use of the workshop materials on the boats is described below. The researcher was present on 34 different excursions and observed the use of workshop materials as presented in Figure 7. The flipchart was only brought on board on 53% of the 34 excursions and it was used on 41% of those trips. The underwater slate was present on 50% of those excursions and utilized in 32%

of those excursions. The flag with the logo was observed to be present on 71% of the excursions the researcher accompanied.

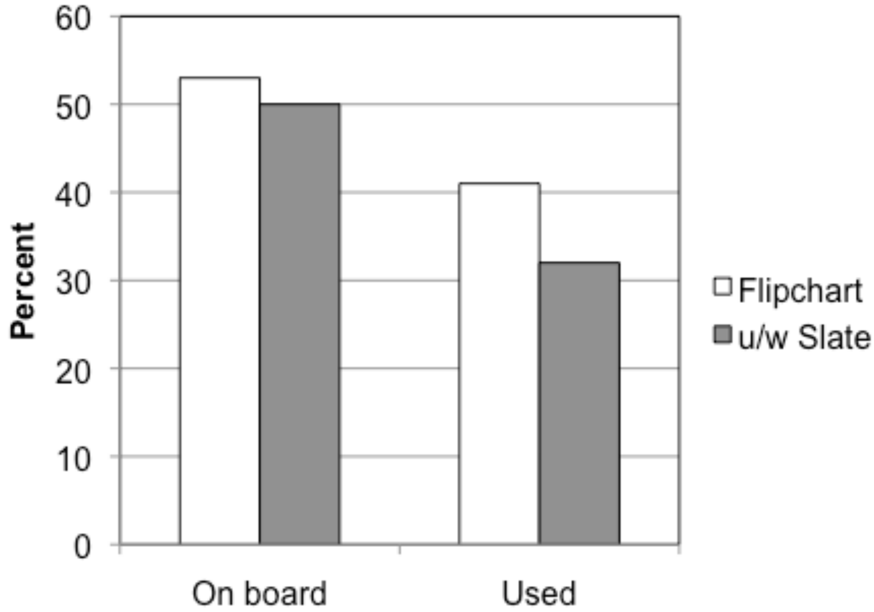


Figure 7. The use of the workshop materials by the boats on excursions directly observed by the researcher.

The researcher was able to monitor 492 boats depart for snorkeling excursions. Of these departures it was not always possible to determine if the workshop materials were present on the boat, or if the materials were used. The results are depicted in Figure 8. The flipchart was only brought on board on 7% of the 492 excursions monitored and it was used on 3% of those trips (for 87% and 89%of the excursions monitored it was not possible to determine if the materials were on board, or if the materials were used respectively). The underwater slate was present on 8% of those excursions and used in 4% of those excursions (for 85% and 88% of the excursions monitored it was not possible to determine if the underwater slate was on board, or if it was used respectively). The flag with the logo was observed to be present on 45% of the excursions the researcher monitored (for 38% of the excursions monitored it was not possible to determine if the flag was displayed).

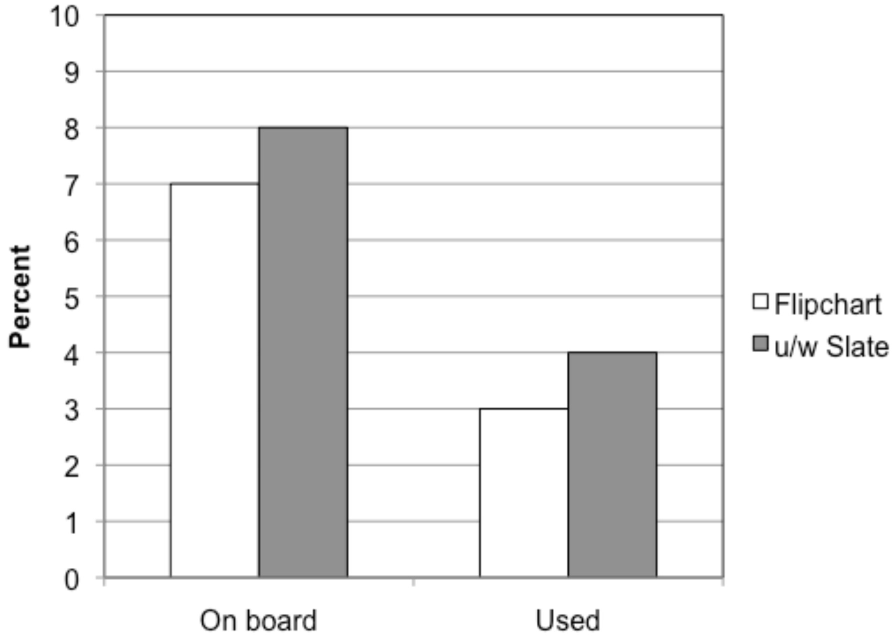


Figure 8. The use of the workshop materials by the boats on excursions monitored by the researcher.

When the unknown data from the excursions only monitored by the researcher was removed, it showed that the snorkel excursions only brought the flipchart and underwater slate on board 54% and 55% of the time respectively. Both the flipchart and the underwater slate were used 30% of the time during those excursions.

The most accurate method of measuring use of materials was when the researcher was present throughout the entire excursion. Yet this method revealed the lowest scores of material use. This method yielded the smallest sample size of excursions monitored. The next most accurate method was monitoring of excursions by the researcher. The researcher was not directly present on these excursions but gathered information regarding material use by observing presence/absence of the materials on the boat and by speaking to clients on those excursions. Material use was slightly higher using this method however these results might not be completely valid. Materials may have been stored out of visual sight from the researcher and clients may not have completely understood what the researcher meant by ‘presentation’. Clients could have stated that they received a presentation that did not include the use of the flipchart or underwater slate. The least accurate method of gathering information on the use of the materials was through the use of the questionnaires collected during ‘The Challenge’. Clients completed these questionnaires in the absence of the researcher. The crew of the snorkel excursions could have influenced the responses of the clients to provide a higher appearance of their excursion. The latter could have been possible as several boats the researcher accompanied on snorkel excursion consistently never brought the materials with them on excursions, yet questionnaires retrieved from these boats indicated that these boats always used the materials. Based on these discrepancies, this method is considered to be the least accurate and therefore not used to determine material use. However, regardless of which of the two remaining methods is used to gauge material use, either method shows that the materials were only used a small fraction of the time.

Even with occasional use of the materials, behavior change was still present. The salient beliefs that snorkelers hold in the Mombasa Marine Park and Reserve about not contacting the reef when snorkeling were not only targeted in the materials. These beliefs were also targeted throughout the expert presentations and group discussions of the interpretive workshop. The changed behavior of the guides (*Chapter 4*: den Haring 2014), paired with the personal observations of the researcher, revealed that the overall behavior of the guides also played a role in influencing the resultant behavior of snorkeling clients. Effective interpretation is not restricted to providing information, but also includes explaining problems, providing solutions and guiding resource users while they engage in resource use (snorkeling in this case) (Mayes and Richins, 2008, Orams and Hill, 1998, Madin and Fenton, 2004, Moscardo et al., 2004, Luck, 2003, Roggenbuck, 1992, Zeppel, 2008). The guides appear to have delivered successful interpretation that ultimately led to behavior change. This behavior change might have been amplified had more use been made of the materials.

'The Challenge'

The lack of material use was already apparent three months after the completion of the second training workshop. An attempt was made to combat this obstacle and assist snorkel operators by introducing a competition. '*The Challenge*' competition yielded 404 completed questionnaires from 85 different excursions. The results of 'The Challenge' are shown in Table 2. The highest scoring factors were the appearance of the crew, the knowledge of the crew, and the professionalism of the crew. Overall the excursion was rated 9.3 out of 10. The quality of the snorkeling excursion received the lowest score (8.9). The clients on the excursions during the competition indicated that the flipchart was used on 75% of the excursions, the underwater slate was used on 76% of the excursions and the salesman folder was used to sell 61% of the excursions. The researcher was present on two of these excursions and was able to validate the use of the materials as described in the responses of questionnaires of those excursions. In both cases the responses accurately described the use of the materials. The remaining 83 excursions cannot be validated for accuracy.

Table 2. The average scores to the questions of the mini questionnaire of '*The Challenge*' (n=404).

Question	Average Score
Appearance of the crew	9.3
Quality of snorkeling equipment	8.9
The manner in which the salesman sold the trip	9.1
The knowledge of the crew about marine life	9.3
Professionalism of the crew	9.3
Value for money for today's excursion	9.0
Rate the trip overall	9.3

This competition succeeded in rejuvenating the material use and eliciting enthusiasm amongst the snorkel operators. The competition also served as a tool the operators used to inform their clients of the training they undertook and got them (the clients) more actively involved in learning about the snorkel industry in the Mombasa Marine Park and Reserve.

Future Training

Six months after the first two training workshops the researcher traveled along the Kenyan coast to other geographic regions that offered snorkel excursions. The purpose of these visits was to meet with snorkel operator representatives and explain the interpretive workshop. The explanation included the aims, purpose, goals and methods of the workshop. This meeting also revealed some of the preliminary results of the differences the workshop had made in the Mombasa Marine Park and Reserve. The meeting sought to discover if the remaining Kenyan coastal communities were interested in replicating similar training in their geographic area for snorkel operators offering snorkel excursions within that area. The researcher visited Malindi Marine Park, Watamu Marine Reserve, Diani, and Kisite-Mpunguti Marine Park (Figure 9). Every coastal community visited expressed an interest to replicate the training at their geographic location. However, to date, only the coastal community at Watamu Marine Reserve has taken the initiative to organize their community members for training (training completed in July 2013 (45 persons) and February 2014 (30 persons)).

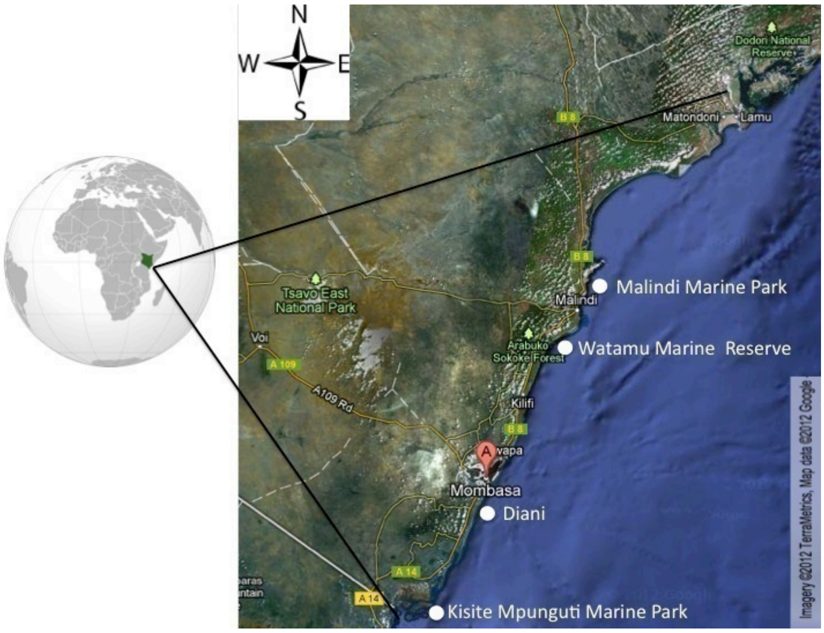


Figure 9. The Kenyan coastline indicating the geographic locations visited to gather interest for replicating the interpretive workshop (from Google Earth).

Limitations

There did exist some limitations that should be addressed in any future or comparable training. A lack of guidance by the workshop trainers following the workshop may have contributed to the infrequent use of the materials. Fortnightly or monthly feedback sessions should have been introduced as an opportunity for some of the snorkel operators and/or crew to come together and discuss challenges, obstacles, issues and successes of implementing the teachings of the workshop. Furthermore, the various tour operators active in hotels along the coastline of the Mombasa Marine Park and Reserve should have been involved so that they were aware of the transformed snorkel excursions. This improvement could have resulted in these tour operators recommending these snorkel excursions to their clients. Refresher training in the form of a one-day workshop should be scheduled annually. These refresher sessions could also act as recruitment opportunities for new crew members.

Conclusion

The coastal community felt that the interpretive workshop was a tremendous success. The first and second workshops were conducted one after the other with a single day between them. The first workshop expected 50 participants, yet only 38 turned up. This turn out was not unusual as not many people were very keen to turn up for a 3-day workshop not knowing exactly what it would entail and how it would benefit them. However, on the morning of the second workshop (just one day after completion of the first workshop) a crowd of 97 people was waiting to start their training (even though only 50 had previously signed up). News of the workshop had obviously spread throughout the Mombasa Marine Park and Reserve. Physical size restrictions of the conference facility meant that only 67 could be admitted to the second workshop but names and contacts details were recorded of the overflow, and they were invited to the third workshop. The large turn out at the start of the second workshop (and also for the first workshop) has shown the enthusiasm and desire that the snorkeling community had towards the training workshop and also their eagerness in transforming their snorkel excursions.

Previous research has shown interpretive training to create pro-environmental behavior change in guides and their clients (*Chapter 4*: den Haring 2014). The effects of this behavior change could have been magnified had more use been made of the workshop materials. The workshop materials incorporated the salient beliefs of snorkelers into the messages they conveyed to snorkelers, and by targeting these messages behavior change is expected (Ham, 2007, Ballantyne and Packer, 2005, Ballantyne et al., 1998). Results of this paper indicate that the materials were not used as much as they could have been. Three different methods were used to determine how often various materials were used (specifically the flipchart and the underwater slate) and each method had different results paired with differing amounts of accuracy.

Appendix 2: Do Recreational Marine Resource Users Do What They Intend and Say They Do in the Mombasa Marine Park and Reserve, Kenya

Sander D. den Haring[1,2]

[1] James Cook University, School for Earth and Environmental Sciences, Townsville, Australia

[2] CORDIO East Africa, #9 Kibaki Flats, Kenyatta Beach, Bamburi, P.O.BOX 10135 Mombasa 80101, Kenya

Abstract

Recreational marine resource use is conducted by a varied group of visitors. Regardless of how minimal this resource use is, or what intentions these visitors have, impacts on these resources are unavoidable. Management authorities of these resources need to know the extent of these impacts to further steer management towards protection of these resources. Traditional monitoring of visitors in the past has relied on self-reported behavior by visitors themselves. Self-reporting of behavior is not always accurate and cannot be relied upon. This research paper illustrates that even though recreational marine resource users (snorkelers) in the Mombasa Marine Park and Reserve had intentions not to disturb the reef when they snorkel, and also indicated having positive attitudes about not disturbing the reef when they snorkel, they still created impacts on the reef. Furthermore, their self-reported behavior did not correspond with their actual monitored behavior. Monitoring snorkeler behavior is time-consuming and is therefore paired with financial investment, however, if this method is the most accurate method of gathering impact data to be used for management purposes, no other data collecting method should be considered, definitely not one that has been shown to be inaccurate (such as self-reported behavior).

Introduction

Marine resources are used by numerous user groups in a multitude of different methods (Hammitt and Cole, 1998). Any resource use, regardless how minimal the usage is, can lead to negative impacts on that resource (Leung and Marion, 2000, Marion and Reid, 2007, Madin and Fenton, 2004). Various methods exist that can be used to monitor these impacts, each with their advantages and disadvantages. Some are time-consuming, others financially dependent, while some depend on data that comes from non-trained laymen. This last category usually comes about when the other two are not viable (due to constraints such as manpower and finances). Examples of methods within this category include ascertaining visitor's intention, or requesting that visitors report on their own behavior (self-reporting). The main drawback to this method is that it is only as good as the data collected, and this in turn depends on the willingness or the ability of the visitor to self-report. This paper examines the relationship between a visitor's behavioral intention, his/her perceived behavioral control, his/her self-reported behavior and his/her actual verified behavior. Understanding how these components relate to each other will determine certain monitoring methods over others so as not to jeopardize the validity of future research.

Theoretical Framework

Recreational Resource Use

Recreational resource use is a global activity enjoyed by many people in a variety of settings. These settings include terrestrial resources (hiking, camping, vehicle motoring, fishing, etc.) and/or marine resources (snorkeling, sailing, scuba diving, boat motoring, fishing, etc.). Reasons people have for partaking in these activities are just as varied and can include: relaxation, socialization, challenge, and excitement (Orams, 2000). Recreational resource use, even minimal (Hammitt and Cole, 1998, Leung and Marion, 2000, Marion and Reid, 2007) creates impacts by the visitors on the resource (Bramley and Carter, 1992, Kimmel, 1999, Madin and Fenton, 2004). Lucas (1979) explained that the term 'impact' is a neutral term since impact can be positive or negative. Society has placed upon this term a value judgment when referring to ecological impacts implying: "an undesirable change in environmental conditions" (Hammitt and Cole 1998, p. 6), thus impact is usually implied to be negative. Visitors and their interaction with these resources must be managed (Marion and Rogers, 1994, Hammitt and Cole, 1998) so as to reduce impacts, especially since nature-based tourism is steadily increasing within the tourism industry (Buckley, 2000, Madin and Fenton, 2004, Orams, 1996a).

Impacts of Recreational Resource Use

Visitors in a marine setting interact with marine resources and wildlife through the following activities: underwater observatories; snorkel boats (with or without snorkeling); semi-submersible craft; and scuba diving (Moscardo et al., 2004). Of these activities, the snorkeling and scuba diving activities are by far the most difficult to manage (Moscardo et al., 2004). Numerous studies have described how recreational resource use has an impact on marine resources (examples include: Plathong, Inglis et al. 2000, Barker and Roberts 2004, Luna, Perez et al. 2009). Accurate monitoring methods must be employed to be able to document these impacts.

Behavior

According to the Theory of Planned Behavior (Ajzen, 1985), any behavior executed by a person is a cumulative and evaluative result of the attitudes, norms and perceived behavioral control that person has towards that behavior. These factors in turn create a behavioral intention towards that particular behavior. Intentions basically state a person's plan to perform, or not perform, a certain behavior. Ajzen (1985) states that intentions can predict behavior if two conditions are met: (1) the behavior is measured right before the behavior occurs; and (2) the behavior must be volitional (under complete control of the individual). Ajzen continues to clarify that intentions change as a result of time and the acquisition of new information. However, an individual does not always feel as if he/she has complete control in achieving the target behavior. This feeling of control is referred to as perceived behavioral control and describes the ease, or difficulty, with which a person feels he/she can, or cannot, perform the target behavior.

Traditional Monitoring

The management of a resource area can use research as a tool to ensure that the goals of the management area are being met. Visitor surveys are often used to gather information regarding the attitudes, intentions and behavior of visitors when they interact with resources to determine impacts on a resource area. As the resultant data is used to further assess the efficacy and direction of the management strategy, it is important that this data accurately reflects how visitors feel about the resources and interact with these resources.

Most research concerning a person's environmental behavior relies on self-report data of the behavior as provided by the participant in a particular study (see Table 1 for a list of examples). If these self-reports of behavior are not accurate, or distorted, then resource management might be flawed which could possibly lead to adopting a management strategy that is not effective nor meeting the goals of the resource area. Various studies have found that self-reports are not always indicative of a participant's actual behavior (examples include: Howard 1999, Zelezny 1999, Gralton, Sinclair et al. 2004). The limitations of self-report measures are that they depend on the following assumptions: people know what their attitudes are (attitudes are thought to be very influential in determining intentions and the subsequent behavior) and that people are always honest (Breckler et al., 2006). Also, participants might always be swayed to provide an answer that is ‘socially acceptable’ or a response that would ‘please’ the researcher (Armstrong and Weiler, 2002, Veal, 2006, Beckmann, 1991). Participants might also not be able to recall their exact behavior or they might simply not be aware of their behavior.

Table 1. Examples of studies that have relied on self-reporting of behavior by respondents to questionnaires and/or interviews.

Study	Title of Publication	Subject of Study
Black and Stern, 1985	Personal and contextual influences on household energy adaptations	Energy behavior
Beaumont, 1998	Promoting pro-environ attitudes and behaviours through ecotourism	Environmental behavior
Ballantyne et al., 1998	Targeted interpretation, exploring relationships among visitors’ motivations, activities, attitudes, information needs and preferences	Environmental behavior
Ballantyne et al., 2009	Tourists’ support for conservation messages and sustainable management practices in wildlife tourism experiences	Environmental behavior
Bamberg and Schmidt, 2003	Incentives, morality, or habit? Predicting students’ car use for university routes with the models of Ajzen, Schwartz, and Triandis	Environmental behavior
Davis et al., 1997	Whale sharks in Ningaloo Marine Park: managing tourism in an Australian marine protected area	Snorkel behavior with whale sharks
De Young, 1990	Recycling as appropriate behavior: a review of survey data from selected recycling education programs in Michigan	Environmental behavior
Howenstine, 1993	Market segmentation for recycling	Recycling behavior
Hrubes et al., 2001	Predicting hunting intentions and behavior: An application of the Theory of Planned Behavior	Hunting behavior
Jacobson and Marynowski, 1997	Public attitudes and knowledge about ecosystem management on department of defense land in Florida	Outdoor recreation behavior
Littlefair, 2003	The effectiveness of interpretation in reducing the impacts of visitors in national parks	Staying on trail, collecting rubbish
Orams, 1997	The effectiveness of environmental education: Can we turn tourists into ‘greenies’?	Environmental behavior
Scott and Willits, 1994	Environmental attitudes and behavior: A Pennsylvania survey	Environmental behavior
Shafer et al., 1998	Visitor experiences and perceived conditions on day trips to the Great Barrier Reef	Snorkel behavior
Sheeran and Orbell, 1998	Do intentions predict condom use	Condom use
Stern et al., 1999	A value-belief-norm theory of support for social movements	Environmental behavior
Tanner, 1999	Constraints on environmental behavior	Car driving behavior and environmental behavior
Taylor and Todd, 1997	Understanding the determinants of consumer composting behaviour	Recycling and composting, and environmental behavior
Thogersen, 2004	A cognitive dissonance interpretation of consistencies and inconsistencies in environmentally responsible behavior	Environmental behavior
Thogersen, 2007	The motivational roots of norms for environmentally responsible behaviour	Environmental behavior
Vinning and Ebreo, 1992	Predicting recycling behavior from global and specific environmental attitudes and changes in recycling opportunities	Recycling behavior

Aims of This Study

Previous studies (Howard, 1999, Robertson, 1986, Wicker, 1971) that have examined self-reported behavior versus actual behavior provided reasons why the two are dissimilar, yet did not offer any further explanations. A person's behavioral intention or perceived behavioral control (how capable someone feels they can or cannot perform a specific behavior) could assist in the understanding of behavior and in turn in the understanding of self-reporting of behavior. The objective of this paper was to explore the relationship between a person's behavioral intention, his/her perceived behavioral control of that behavior, his/her actual behavior and the self-reported measure of that behavior in a recreational marine resource setting. More specifically this paper sought to answer the following:

1. Does self-reporting of behavior represent an accurate measure of actual behavior?
2. Can behavioral intention of a snorkeler be used to predict potentially harmful actions made by that snorkeler?
3. Can perceived behavioral control of a snorkeler be used to predict potentially harmful actions made by that snorkeler?

Due to the associated discrepancies with self-reporting of behavior the overall research project (*Chapter 4*: den Haring 2014) was structured to avoid self-reporting of behavior by participants. The overall research project used questionnaires to identify behavioral intentions and perceived behavioral control of participants. The next step involved the researcher monitoring participant behavior during their interaction with the resources. A follow up questionnaire was administered upon completion of the snorkel excursion that included a self-report measure of behavior. This method allowed for an accurate data set of participant's behavioral intention and perceived behavioral control, versus verified actual behavior that could then be used to validate the self-reporting by participants.

Methods

Study Site

This study was conducted in the Mombasa Marine Park and Reserve, Kenya (Figure 1). The Mombasa Marine Park and Reserve is located north of Mombasa island and spans nearly 15 kilometers of coastline. The park was legally gazetted in 1986, however legal protection was not enforced until the mid-1990's (McClanahan, 1994). The park and reserve are currently managed by the Kenya Wildlife Service, under authority of the Ministry of Environment and Natural Resources (McClanahan et al., 2005). The park covers a total of 210 km^2 (200 km^2 for the Reserve and 10 km^2 for the Park). Within the park extractive activities are prohibited, while the reserve tolerates artisanal fishing practices (Ransom and Mangi, 2010). Recreational resource use, such as sailing, scuba diving and snorkeling, is permitted in both the park and reserve. All snorkeling excursions that are included in this study were conducted in the

Mombasa Marine Park. The snorkeling excursions only frequented patch reefs within the lagoon of the park.

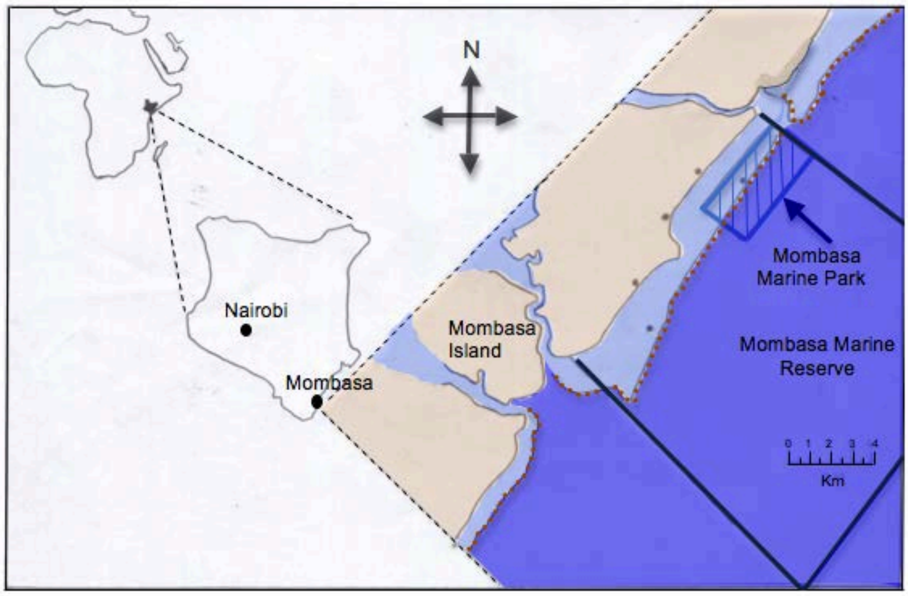


Figure 1. Map of the Mombasa Marine Park and Reserve, Kenya, showing the reserve and park boundaries.

The Research Design

The research involved gathering data regarding a snorkeler's behavioral intent, actual snorkeling behavior and his/her snorkel experience. At the start of a snorkeling excursion a visitor was asked to complete a pre-excursion questionnaire. This questionnaire contained questions about the snorkeler's perceived behavioral control and behavioral intent about contacting the reef substrate while snorkeling. This questionnaire was completed before any resource interaction occurred. Upon arrival at the snorkel location participants were followed in the water during the snorkeling portion of the excursion by the researcher (in full snorkel gear) and their interactions with the coral reef were recorded (monitoring duration was seven minutes). Upon completion of the snorkel excursion participants were asked to complete a post-excursion questionnaire about their experience throughout the snorkel excursion. This questionnaire contained a self-report measure concerning the participant's snorkel behavior and interaction with the resources. All participants were chosen by approaching the first boat with clients from the busiest departure point in the park. If the clients refused, or they indicated that they would not snorkel, the next boat was approached.

Questionnaire Design

The pre-excursion questionnaire (completed prior to any resource use) used in this study was designed to obtain a participant's behavioral beliefs, normative beliefs, control beliefs and behavioral intention beliefs. These questions were Likert-scaled, bi-polar statements on a 7-point scale and derived from past studies (Fishbein and Ajzen, 2010, Francis et al., 2004). The post-excursion questionnaire (completed once the snorkeling excursion was finished) consisted of questions exploring basic demographics, the respondent's experience throughout the snorkel excursion and a self-report measure of the respondent's snorkel behavior. The self-report measure consisted of a yes/no response to having contacted the reef substrate while snorkeling. The remaining questions consisted of Likert-scaled, bi-polar statements (either 5 or 7-point scales) and multiple-choice questions. Both questionnaires were pre-tested for clarity and comprehension, by 89 and 79 participants (pre- and post-questionnaire respectively), and any questions/wording that were ambiguous or unclear were modified or discarded. The questionnaires were available in English, French and German. The French and German translations were translated into the respective languages by one native speaker and then translated back into English by another native speaker. Any discrepancies were discussed and clarified.

Snorkel Behavior

To determine the interactions of snorkelers with marine resources their behavior needed to be monitored. The behavior of the snorkelers was monitored by following participants in the water at a distance of 2-3m for a duration of seven minutes and noting down their behavior. Monitoring of snorkelers was only completed in water depth where snorkelers had the option of contacting the reef substrate and was temporarily halted when participants entered water that was too deep for them to be able to make contact with the reef substrate. Snorkelers were not informed that they were being monitored. Multiple snorkelers were monitored simultaneously when permitted by visibility and group dispersion of the snorkelers. There were originally 12 separate actions that were measured (Table 2).

Table 2. Definitions of actions for monitoring of snorkelers. All definitions below are scored per single occurrence.

Item	Definition
Alive Intentional (AI)	Anytime a snorkeler intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Alive Non-intentional (AN)	Anytime any part of a snorkeler's body or an extension thereof (fins, camera, etc.) comes into contact with living substrate that the individual did not plan or was unaware of.
Dead Intentional (DI)	Anytime a snorkeler intentionally extends a limb, or an extension thereof (fins, camera, etc.) to make contact with non-living substrate. Examples include but are not limited to the following: grabbing of substrate, steadying oneself, pushing oneself away from substrate (using either arms or feet), standing on substrate and laying on substrate.
Dead Non-intentional (DN)	Anytime any part of a snorkeler's body or an extension thereof (fins, camera, etc.) comes into contact with non-living substrate that the individual did not plan or was unaware of.
Wildlife Handling (Wildlife)	Anytime a snorkeler handles wildlife. This could be self-initiated or it could be wildlife that has been offered to them by someone else. Examples include handling a starfish, handling a shell with a living organism in it, touching fish, feeding fish.
Sedimentation	Anytime a snorkeler makes a movement with a limb (arm or leg) that results in sediment becoming suspended in the water (creating a dust cloud).
Uncomfortable Standing on Alive Substrate (St Alive unCOM)	The intentional standing on living substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.
Uncomfortable Standing on Dead Substrate (St Dead unCOM)	The intentional standing on dead substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.
Comfortable Standing on Alive Substrate (St Alive COM)	The intentional standing on living substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Comfortable Standing on Dead Substrate (St Dead COM)	The intentional standing on dead substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Standing on Seagrass comfortable (St SG COM)	The intentional standing on seagrass substrate in a manner that exhibits comfort by the snorkeler. This standing behavior can include smaller steps taken in the immediate vicinity while in the process of standing on the substrate.
Standing on Seagrass Uncomfortable (St SG unCOM)	The intentional standing on seagrass substrate in a manner that exhibits a lack of comfort by the snorkeler. This standing behavior often includes repetitive smaller steps taken on the substrate while establishing a comfortable foothold/standing position.

Alive Substrate: Any living substrate excluding algal species and plant species. Examples include: sponges, corals, fish.

Dead Substrate: Any non-living substrate including algal species and plant species. Examples include: living rock, macro algae.

Sample Size

The pre-excursion questionnaire had a total of 204 participants. Two hundred and nine participants were monitored during their snorkel. There were also 209 participants that self-reported their behavior on the post-excursion questionnaire. Some of the snorkel excursions included some form of interpretation offered to participants. Preliminary analysis indicated no differences between those participants that had received interpretation and those that had not received it (den Haring, 2014). For the purposes of this paper the participants of both groups were pooled together.

Statistical Analysis

Independent samples t-tests were used to distinguish differences between participants who indicated that they contacted the reef from those who denied any contacts with the reef were made during their snorkel. One-tailed t-tests were used to compare snorkel behavior (counts of contacts in monitoring period) versus self-reported behavior of participants (indicated to having contacted the reef or not).

Results

Did You Touch the Coral Substrate Today?

Two hundred and nine participants answered the following question in the post-excursion questionnaire: *During your snorkeling activity, did you touch the coral substrate today (with hands, fins, etc that you are aware of)?* Figure 2 shows that the average number of touches of the 'No Group' (participants who stated that they did not touch the coral substrate while snorkeling) was fewer than those of the 'Yes Group' (those that indicated that they did touch the coral substrate while snorkeling) for the 7-minute monitoring period. There was a significant difference between the 'No Group' and 'Yes Group' participants that touched the living substrate (independent samples t-test, p=0.005, n=209), and all substrate (living and non-living substrate; independent samples t-test, p=0.003, n=209). For the touches onto non-living substrate the difference was not significant (independent samples t-test, p=0.105, n=209). Table 3 indicates the percentages of those participants of the two groups that either touched, or did not touch, the different substrate types.

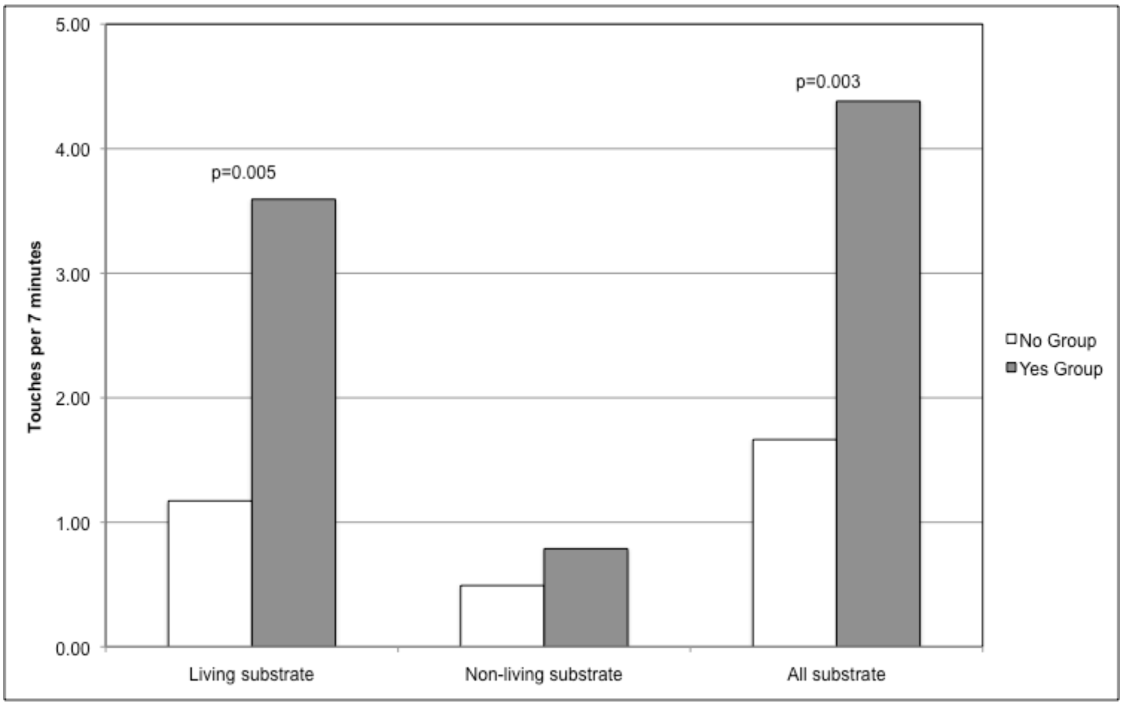


Figure 2. The average number of touches participants made per 7 minutes onto living substrate, non-living substrate and total touches on all substrate. The 'No Group' (n=128) consists of those participants who denied having touched the reef while the 'Yes Group' (n=81) consists of those participants who indicated having touched the reef while snorkeling. Significant differences between two groups are indicated by the p-value in the figure.

Table 3. The percentage of all participants who touched or did not touch the different substrate types during the 7-minute monitor period (n=209).

Type of Substrate	% of participants that touched		% of participants that did not touch	
	NO Group	YES Group	NO Group	YES Group
Living Substrate	15.8%	19.6%	45.5%	19.1%
Non-living Substrate	15.3%	12.0%	45.9%	26.8%
All Substrate (living and non-living)	24.9	23.4%	36.4%	15.3%

'No Group' Self-reporting is Inaccurate

One hundred and twenty eight participants answered that they did not touch the coral substrate while snorkeling. Table 4 indicates the percentages of these participants for touches on the different substrate types. A one-sample t-test was conducted to determine if the mean number of touches that the 'No Group' made was significantly more than zero. The H0 for this test was that the mean number of touches was equal to zero, while the H1 was that the mean number of touches was greater than zero. The results of the t-test show that the difference is significant for all three substrate types (living, non-living and both combined) with p-values of 0.001, 0 and 0 respectively (n=128). The H0 was rejected and the H1 accepted, therefore what the participants said they did, did not reflect their actual performed behavior.

Table 4. The percentage of 'No Group' participants who touched, or did not touch, the different substrate types during the 7-minute monitor period (n=128).

Type of Substrate	% of participants that touched	% of participants that did not touch
Living Substrate	74%	26%
Non-living Substrate	75%	25%
All Substrate (living and non-living)	59%	41%

Intention vs. Contacts

Most participants who intended not to disturb life on a reef during a snorkeling excursion did not have any contacts with the reef while snorkeling during the 7-minute monitoring period. Figure 3 shows the relationship between the intentions of what the participants intended to do compared to their behavior for during the 7-minute monitoring period. This particular measure of intention was a response on a seven-point scale to the following statement: *I intend to avoid disturbing life on the reef while snorkeling today* (answered on a 7-point scale of: definitely true to definitely false).

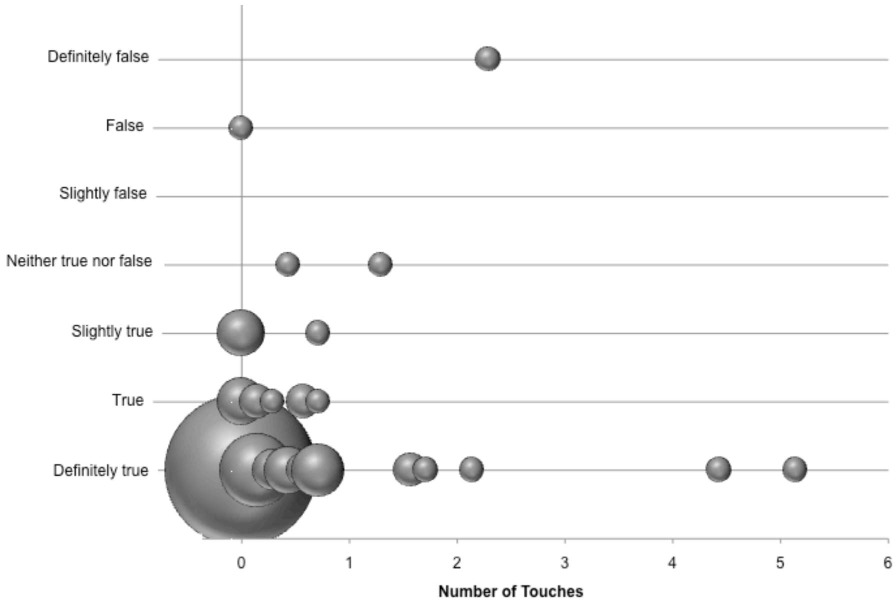


Figure 3. The number of touches (in a 7-minute monitoring period) the participants made on the coral reef while snorkeling compared to the intention of the participants. The size of the circle reflects the frequency for those contact/intention combinations (the bigger the circle, the more frequent that combination occurrence was; n=204).

Perceived Behavioral Control vs. Contacts

Most participants who believed they had control over not disturbing any life on the coral reef while snorkeling did not contact the reef substrate. However, the same also held true for participants who believed they had less control. Figure 4 shows the relationship between the perceived behavioral control participants thought they had about not disturbing life on a reef compared to their behavior during the 7-minute monitoring period. This particular measure of control was a response on a seven-point scale to the following statement: *For me to go out and not disturb any life on the reef while snorkeling today would be* (answered on a 7-point scale of: very possible to very impossible).

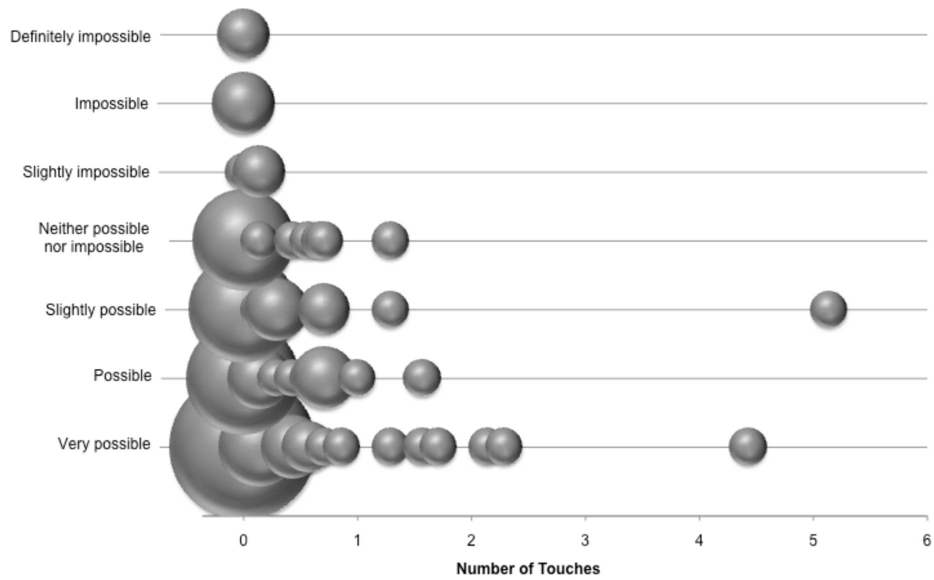


Figure 4. The number of touches (in the 7-minute monitoring period) participants made on the coral reef substrate while snorkeling compared to the perceived behavioral control of the participants. The size of the circle reflects the frequency for those contact/control combinations (the bigger the circle, the more frequent that combination occurrence was; n=204).

Number of Contacts on Reef Substrate

The contacts with the coral reef described above are for a 7-minute period. When this 7-minute period is transformed to the equivalent of a 30-minute period (30 minutes reflects the average duration of a snorkel activity in the Mombasa Marine Park and Reserve) it can be seen that numerous contacts appear to be made by a single snorkeler during a snorkel excursion (Tables 5 and 6). Table 5 shows that even though most contacts made by those participants who intend not to disturb life on the reef are few, there are still numerous contacts with the reef regardless of good intentions (see the cumulative contacts for intention groups 1-2 and 1-3). The same holds true for those participants who believe they had good perceived behavioral control in not disturbing life on the reef (Table 6).

Table 5. The number of participants who would have made more or less than five projected touches on the reef substrate while snorkeling for a 30-minute period compared to their intention not to disturb life on a coral reef (sample size n=96).

Intention to avoid disturbing life on the reef	Participants with <5 touches	Participants with >5 touches
Definitely True-1	54	21
True-2	6	6
Slightly True-3	4	1
Neither True nor False-4	0	2
Slightly False-5	0	0
False-6	1	0
Definitely False-7	0	1
Total touches for intentions 1-2	60	27
Total touches for intentions 1-3	64	28

Table 6. The number of participants who would have made more or less than five projected touches on the reef substrate while snorkeling for a 30-minute period compared to their perceived behavioral control in not disturbing life on a coral reef (sample size n=95).

Perceived behavioral control in not disturbing any life on the reef	Participants with <5 touches	Participants with >5 touches
Very Possible-1	22	13
Possible-2	13	8
Slightly Possible-3	10	7
Neither Possible nor Impossible-4	9	5
Slightly Impossible-5	3	0
Impossible-6	3	0
Very Impossible-7	2	0
Total touches for control beliefs 1-2	35	21
Total touches for control beliefs 1-3	45	28

Discussion

It is logical that those participants who indicated they did touch the coral touched it more frequently than those who did not admit having touched the coral. However, the fact that the ‘No Group’ had touched the coral substrate significantly more than zero times is slightly more surprising. This finding indicates that the participants did not accurately self-report their behavior. Reasons for this could be explained by one of the following reasons (Armstrong and Weiler, 2002, Beckmann, 1991, Veal, 2006):

1. they did not realize that they came into contact with the coral reef;
2. they described their preferred behavior (regardless whether they performed it in such a manner or not);
3. they described behavior that they normally adhere to (just not this time);
4. they answered the question in a manner that was deemed socially acceptable (either over or under estimating of behavior);
5. they answered the question in a manner that would satisfy the researcher (either over or under estimating of behavior);
6. they only touched the coral a few times and did not think that those few touches would make a difference;
7. they might not know what coral is; or
8. they were intentionally dishonest in their answer.

Strong intentions about not disturbing the life on a reef do not automatically indicate that the reef will not be disturbed. Participants with strong intentions still had numerous contacts with the reef. The same holds true for what participants perceive as their behavioral control in being able to carry out a behavior (in this case not disturbing life on a reef). Therefore asking a participant what they will/will not do, or whether they can/cannot perform a specific behavior is not guaranteed to be indicative of their actual behavior. The resultant outcome is that management of resources is necessary for all individuals, regardless how environmentally minded (strong intentions and perceived control) they may be, or think they may be.

Studies have focused on the limitations and inaccuracy of self-reporting of behavior throughout the past four decades (examples include: Wicker 1969, Zelezny 1999, Gralton, Sinclair et al. 2004). These studies have shown that self-reporting of behavior is inaccurate compared to actual behavior. Regardless of these publications, numerous studies continue to rely on traditional monitoring methods of asking participants what they will do, or what they did do, rather than observing what they actually did do. Whatever reason a researcher has for choosing to rely on self-reporting, or whatever reason a participant may give for not accurately reporting their behavior, the lesson to be remembered is that self-reporting is not an accurate form of data collection. There are substantial financial costs and time commitments to gathering actual behavior data, but these should be considered as necessary since self-reporting of behavior is paired with inaccuracy. Studies should cease focusing on participants telling the researchers what they did, or what they would do, but rather on monitoring what they actually did do.

Appendix 3: Demographics of Snorkeling Visitors to the Mombasa Marine Park and Reserve, Kenya

Sander D. den Haring[1,2]

[1] James Cook University, School for Earth and Environmental Sciences, Townsville, Australia

[2] CORDIO East Africa, #9 Kibaki Flats, Kenyatta Beach, Bamburi, P.O.BOX 10135 Mombasa 80101, Kenya

Abstract

Understanding who the average visitor is to a protected area will assist the various stakeholders in catering for these visitors. Accepting the important reasons these visitors have for visiting a park and what attributes they consider important will assist the management authority in enforcing the protection and sustainability of the resources within the protected area. The snorkel and hotel industry could benefit by knowing who their average customer is and directing their marketing efforts accordingly. In the Mombasa Marine Park and Reserve the average visitor that snorkeled within the park was either male or female, aged between 25-54, resided in Europe, and spoke his/her native tongue as their main language. Furthermore, the average knowledge of marine ecosystems these visitors had indicated that there was room for improvement. Most snorkeling visitors to the park were first-time visitors, gathered information about the park via word-of-mouth, snorkel with their family and/or friends in small groups of 2-4 persons, and expressed a desire to learn more about nature and coral reefs. Snorkelers in the Mombasa Marine Park and Reserve were either novices (first timers) or had been snorkeling for more than 10 years, considered snorkeling one of many activities they participate in, enjoy a holiday with snorkeling option once a year and rated the reefs of the Mombasa Marine Park and Reserve less than other reefs they had frequented. This data is of crucial importance to stakeholders that are directly involved with these snorkeling visitors to the park: the management authority, the hotel industry and the snorkeling industry.

Introduction

A management tool often used to protect (marine) resources is that of a (marine) protected area (Brown et al., 2001, Pomeroy et al., 2004, Cinner, 2007). Every marine protected area is unique in that the determinants leading to its creation (specific circumstances in that particular area) and the objectives it has been charged with are different (Lockwood et al., 2006). Some marine protected areas exist purely for recreational activities such as fishing, watersports entertainment, snorkeling/scuba diving, while others have been created solely for protecting the habitat and the marine life associated with it. Others have the primary goal to act as a breeding ground for a specific organism, while others encompass a combination of some, or all the reasons listed previously. Those marine protected areas that offer recreational activities must find the balance between sustaining resources and offering recreational experiences (Marion and Reid, 2007). To maintain effective management of those resources the management authority must have a clear understanding of the recreational marine resource user. Behavior patterns, visitation patterns and basic demographics must be researched so that management can be steered accordingly to ensure that visitor needs are met and resources are afforded the protection they require. When resource management is unaware of the characteristics of the consuming visitor (profiles, motivations, experiences) it becomes disadvantageous, as they can no longer manage effectively (Higham and Carr, 2002).

Hammitt and Cole (1998) define recreation as an activity that: “offers a contrast to work-related activities and that offers the possibility of constructive, restorative and pleasurable benefits” (p.3). Visitors engage in these activities for a multitude of reasons that include, but are not limited to the following: relaxation, socialization, challenge, and excitement (Orams, 2000). Recreational resource use is further defined when these activities depend upon the natural resources of the areas in which they are used. Recreational resource use is a global activity enjoyed by many people in a variety of settings including terrestrial (hiking, camping, vehicle motoring, fishing, etc.) and/or marine (snorkeling, sailing, scuba diving, boat motoring, fishing, etc.). Hammitt and Cole (1998) summarize the reasons for resource use below:

> (1) visitors engage in different activities for different reasons and in different ways, (2) visitors participate in the same activities for different reasons, and (3) they utilize recreational environments in different ways to achieve the experiences they desire (p. 178).

This definition is relevant as understanding the varied reasons visitors have for interacting with resources is crucial for effective management. Often times protected area managers have assumed that they know what their visitors needs and motivations are, yet research has shown that what managers think and what visitors think are not always similar (examples listed in Absher, McAvoy et al. 1988(Glaspell et al., 2003, Watson and Roggenbuck, 1998)).

The ability to measure visitor demographics is critical in determining effective management of resources (Wearing et al., 2008). Of importance is that every resource area is different, as is every visitor to that specific resource area (Wearing et al., 2008). This paper examines the characteristics of visiting snorkelers to the Mombasa Marine Park and Reserve. The aims of this paper were to:

1. Develop profiles of visitors that frequent the Mombasa Marine Park and Reserve and engage in snorkeling activities;
2. Understand visitation patterns of visitors;
3. Determine motivations visitors have for partaking in a snorkel excursion; and,
4. Determine marine park attributes visitors find important.

Methods

Study Site

This study was conducted in the Mombasa Marine Park and Reserve, Kenya (Figure 1). The Mombasa Marine Park and Reserve is located north of Mombasa island and spans nearly 15 kilometers of coastline. The park was legally gazetted in 1986, however legal protection was not enforced until the mid-1990's (McClanahan, 1994). The park and reserve are currently managed by the Kenya Wildlife Service, under authority of the Ministry of Environment and Natural Resources (McClanahan et al., 2005). The park covers a total of 210 km^2 (200 km^2 for the Reserve and 10 km^2 for the Park). Within the park extractive activities are prohibited, while the reserve tolerates artisanal fishing practices (Ransom and Mangi, 2010). Recreational resource use, such as sailing, scuba diving and snorkeling, is permitted in both the park and reserve. All snorkeling excursions that are included in this study were conducted in the Mombasa Marine Park. The snorkeling excursions only frequented patch reefs within the lagoon of the park.

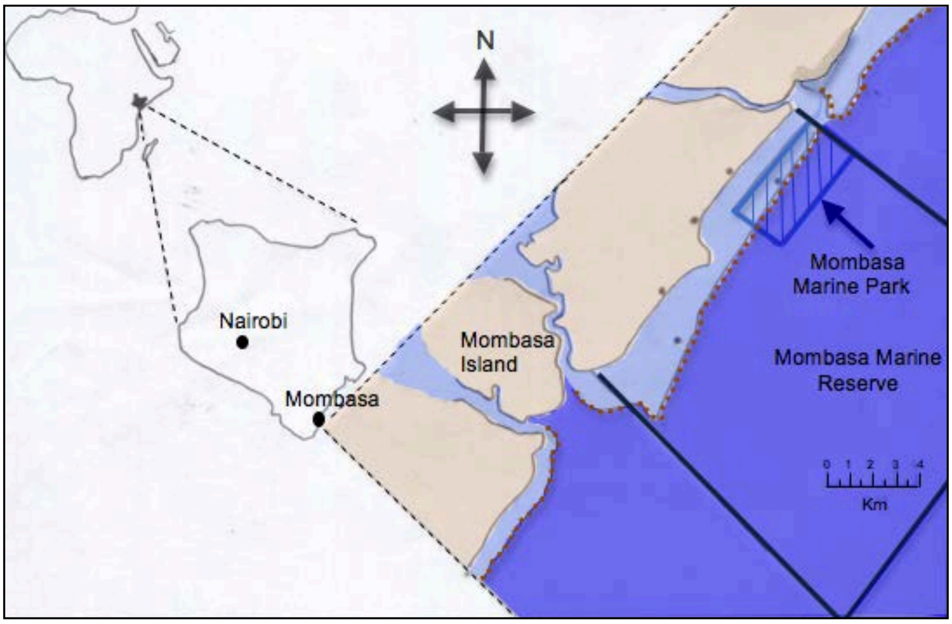


Figure 1. Map of the Mombasa Marine Park and Reserve, Kenya, showing the reserve and park boundaries.

The Research Design

Information on basic demographics was collected from personally administered questionnaires as part of a larger study (*Chapter 4*: den Haring 2014). The demographic information was then analyzed to reveal the general characteristics of visiting snorkelers to the Mombasa Marine Park and Reserve.

Snorkeler Excursion Overview

Bamburi Coral Garden (Figure 2) is a lagoon patch reef visited by snorkel operators as part of their excursion. The site has a maximum depth of 7m within the middle of an ovular area that shallows out to a depth of 1m around the edges. This core area has a length of ~50m and a width of ~30m. This core area, and the surrounding ~40m in all directions (depth range is 0.5-1.5m), is where the snorkeling activities occur. The area labeled as the Reef Walk Area in Figure 2 is an area visited by all snorkeling excursions when permitted by the tide. At low tide this reef flat is exposed and the clients of the snorkeling boats venture on a guided walk on this reef flat. Occasionally these snorkeling boats also frequent additional patch reefs for more snorkeling activities (Starfish ~50x40m, 1-1.5m depth range; Severin Bommies ~70x40m, 1.5-2.5m depth range). Within the Mombasa Marine Park and Reserve there are 5 main departure points for the snorkel boats that provide the snorkeling excursions (Figure 2). One of these departure points, located in the southern part of the Reserve does not frequent the sites described above but rather frequents only areas in the southern reserve. The boats (only two boats) operating from this departure point were not included in this study. At any moment there are ~25-30 snorkel boats operating within the Mombasa Marine Park and Reserve depending on any ongoing maintenance.

Figure 2. Map of the Mombasa Marine Park and Reserve showing the snorkeling locations and the four northern departure points (from Google Earth).

Questionnaire

This study used data gathered from two personally administered questionnaires (see *Appendix 4* for the complete questionnaires). The first questionnaire (pre-excursion questionnaire) was completed by respondents at the start of a snorkel excursion but before the boat departed and prior to any interpretation. The second questionnaire (post-excursion questionnaire) was completed by participants at the end of their snorkeling excursion in the Mombasa Marine Park and Reserve. The demographic data reported in this paper was one section of a larger study (*Chapter 4*: den Haring 2014). The sample sizes in this study were bigger than those of the main study as not all participants of the main study completed both questionnaires. For the purposes of describing the average snorkeler in the Mombasa Marine Park and Reserve, the incomplete data were included in this study. The demographic sections of the questionnaire consisted of multiple-choice questions and an open-ended question for date of birth. The questionnaires were pre-tested for clarity and comprehension by 89 and 79 respondents (pre-excursion and post-excursion questionnaires respectively). Any questions/wording that were ambiguous or unclear were modified or discarded. The questionnaires were available in English, French and German. The French and German translations were translated into the respective languages by one native speaker and then translated back into English by another native speaker. Any discrepancies were discussed and clarified.

Main Study

The main study referred to previously, tested the effects of interpretation on snorkeler behavior (*Chapter 4*: den Haring 2014). That study distinguished between two different groups: a WITHOUT interpretation group and a WITH interpretation group. All participants were chosen by approaching the first snorkel boat with clients from the busiest departure point in the park. If the clients refused, or they indicated that they would not snorkel, the next boat was approached.

Sample Size

The sample size of this study consisted of 268 respondents for the knowledge portion of the demographics and 245 respondents for the remaining portions (more respondents completed the pre-excursion questionnaire compared to the post-excursion questionnaire). Data were collected throughout 13 consecutive calendar months (Jan 11, 2011 until Jan 26, 2012). Data collection occurred throughout these months and did not focus on any particular time period such high/low season of visiting tourists, school holidays, weekends and normal weekdays.

Statistical Analysis

Frequency distributions of the various demographic data were calculated using The Statistical Package for Social Sciences (SPSS). To test for differences between the WITHOUT interpretation and WITH interpretation groups, independent samples t-tests and chi-square tests were used.

Survey Limitations

This survey had various limitations that could not make it representative of the visitors, nor of the visitors who participate in snorkeling activities, in the Mombasa Marine Park and Reserve. The limitations of this study were:

1. Participants of this study had to be able to read and write in English, French or German.
2. Only those participants that indicated to going snorkeling were included in this study.
3. Only those participants that were willing to participate in this study contributed data.
4. The data represent only information gathered from visitors during the period of January 11, 2011 until January 26, 2012.

Results and Discussion

These data can be used to describe visitors who intend to snorkel in the Mombasa Marine Park and Reserve. The results indicate overall demographic characteristics of the respondents but also show these characteristics for the WITHOUT and WITH groups separately. Subsequent analyses reveal how similar the two groups are as justification for combining the data from all respondents into one combined group.

The following socio-demographic characteristics are described below: respondent profile (gender, age, country of residence, preferred language); respondent's knowledge of the marine ecosystem; respondent's visit to park (visits to the Mombasa Marine Park and Reserve, source of park information, type of group visiting the park with, group size of visitors to the park, number of visitors on the snorkel boats, reasons for visiting the park, and importance of marine park attributes); and respondent's snorkel behavior (how long the respondents have been snorkeling, the importance of snorkeling to the respondents, how often the respondents go snorkeling, who the respondents snorkel with most often, and how the reef of the Mombasa Marine Park and Reserve compares to other reefs they have seen).

Respondent Profile

The sample of this study consisted of 118 males (48%) and 127 females (52%). Most respondents were aged between 25-54 years (Table 1). A small percentage of the respondents were aged above 64 years (4.9%). Five respondents did not answer this question. There was no significant difference between the WITHOUT and WITH group respondents (independent samples t-test, p=0.092).

Table 1. The age group distribution of the respondents. The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Age Group	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
15-24	36	14.7		12	10.3	24	18.6
25-34	58	23.7		30	25.9	28	21.7
35-44	46	18.8		20	17.2	26	20.2
45-54	52	21.2		28	24.1	24	18.6
55-64	36	14.7		16	13.8	20	15.5
Other	12	4.9		7	6.0	5	3.9
No Response	5	2.0		3	2.6	2	1.6
Total	245	100		116	100	129	100

Residents of the United Kingdom (to include England, Northern Ireland, Scotland, and Wales) were the most dominant respondents in this study and consisted of half of all respondents

(51.4%; Table 2). Germany (15.9%) and France (5.7%) were the next most frequent countries where respondents resided. Eighty-three percent of all respondents resided in Europe, eight percent resided in Africa, six percent resided in North America, while the remainder resided in Japan and Russia (each 0.4 percent equivalent to one respondent). One respondent failed to answer this question. No statistical test was performed on a comparison between the WITHOUT and WITH groups due to the wide variety of responses.

Table 2. The country of residence of the respondents (listed alphabetically). The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Country	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Australia	2	0.8		1	0.9	1	0.8
Austria	2	0.8		0	0.0	2	1.6
Belgium	6	2.4		2	1.7	4	3.1
Canada	2	0.8		2	1.7	0	0.0
Ethiopia	7	2.9		5	4.3	2	1.6
Finland	2	0.8		0	0.0	2	1.6
France	14	5.7		8	6.9	6	4.7
Germany	39	15.9		23	19.8	16	12.4
Holland	2	0.8		0	0.0	2	1.6
Ireland	1	0.4		1	0.9	0	0.0
Italy	2	0.8		0	0.0	2	1.6
Japan	1	0.4		0	0.0	1	0.8
Kenya	7	2.9		3	2.6	4	3.1
Norway	4	1.6		2	1.7	2	1.6
Russia	1	0.4		0	0.0	1	0.8
South Africa	6	2.4		1	0.9	5	3.9
Sweden	6	2.4		0	0.0	6	4.7
Switzerland	1	0.4		1	0.9	0	0.0
UK	126	51.4		57	49.1	69	53.5
USA	13	5.3		9	7.8	4	3.1
No Response	1	0.4		1	0.9	0	0.0
Total	245	100		116	100	129	100

The main languages spoken by the respondents were English (64.8%), German (17.2%) and French (7.8%), corresponding to the three main countries of residence of the respondents (Table 3). The remaining primary languages of the respondents were European languages, as well Japanese and Russian for the individuals from those countries. No statistical test was performed on a comparison between the WITHOUT and WITH groups due to the wide variety of responses.

Table 3. Main languages spoken by the respondents (listed alphabetically). The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Language	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Dutch	6	2.5		0	0.0	6	4.7
English	158	64.8		73	62.9	85	65.9
Finnish	1	0.4		0	0.0	1	0.8
French	19	7.8		13	11.2	6	4.7
German	42	17.2		24	20.7	18	14.0
Italian	5	2.0		2	1.7	3	2.3
Japanese	1	0.4		0	0.0	1	0.8
Norwegian	3	1.2		2	1.7	1	0.8
Polish	3	1.2		1	0.9	2	1.6
Russian	1	0.4		0	0.0	1	0.8
Slovak	1	0.4		1	0.9	0	0.0
Swedish	5	2.0		0	0.0	5	3.9
Total	245	100		116	100	129	100

Summary-Respondent Profile

The average snorkeling visitor to the Mombasa Marine Park and Reserve was as likely to be either male or female, aged between 25-54, resident in Europe (more specifically the United Kingdom, Germany or France) and speaks as his/her main language English, German or French. The gender and age distribution found in this study compares to visitors frequenting terrestrial parks in Australia (western Victoria, New South Wales and Tasmania) (Wearing et al., 2008, Archer and Griffin, 2004, Griffin and Archer, 2005) and the Great barrier Reef in Australia (Shafer et al., 1998).

Respondent's Knowledge of the Marine Ecosystem

In the pre-excursion questionnaire respondents were asked seven multiple-choice questions about the marine ecosystem. The sample size of respondents for this questionnaire was 268 respondents (123 in the WITHOUT group and 145 in the WITH group). In the following analysis, when the sample size is greater than 268 it indicates that respondents answered questions with multiple answers and each answer was counted in the analysis. Sample sizes fewer than 268 indicate that not all respondents answered the question. Most respondents answered that ‘corals’ were the main building blocks of reefs. The remainder of the respondents was divided amongst ‘rocks’, ‘calcium deposits’, ‘old volcanic lava’ and ‘don’t know’. Table 4 shows these results. There was no significant difference between the respondents of the WITHOUT and WITH groups (chi-square test, df=4, p=0.83, n=278; contingency table=5 responses vs. 2 groups (with/without)).

Table 4. What respondents believe to be the main building blocks of reefs. The left half of the table shows all respondents (n=269) while the right half shows the distribution of the respondents in the WITHOUT group (n=123) and the WITH group (n=146) separately.

What best describes the main building blocks of reefs?	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Corals	189	68.0		88	70.4	101	66.0
Rocks	27	9.7		13	10.4	14	9.2
Calcium deposits	29	10.4		12	9.6	17	11.1
Old volcanic lava	13	4.7		5	4.0	8	5.2
Don’t know	20	7.2		7	5.6	13	8.5
Total	278	100		125	100	153	100

Forty-four percent of the respondents believed corals to ‘consist of a colony of organisms’ while 28.6% believed it to be ‘living rock’ (Table 5). Eleven percent believed coral to be ‘an animal’ while 8.3% believed it to be ‘a plant’. The remainder of the respondents was split equally between believing corals to be ‘a colorful rock’ and not knowing the answer to the question. There was a significant difference between the respondents of the WITHOUT and WITH groups (chi-square test, df=5, p=0.009, n=278; contingency table =6 responses vs. 2 groups (with/without)). When the three smallest categories (‘colorful rock’, ‘plant’ and ‘don’t know’) were removed the difference between the two groups was still significant (chi-square test, df=2, p=0.016, n=233: contingency table =3 responses vs. 2 groups (with/without)). When the ‘animal’ category was removed as well the difference was non-significant (chi-square test, df=1, p=0.159, n=202; contingency table=2 responses vs. 2 groups (with/without)). Therefore the main difference between the WITHOUT and WITH groups can be attributed to the ‘animal’ category.

Table 5. What respondents believe to best describe corals. The left half of the table shows all respondents (n=268) while the right half shows the distribution of the respondents in the WITHOUT group (n=123) and the WITH group (n=145) separately.

What best describes corals?	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Living rock	80	28.8		30	24.0	50	32.7
Colorful rock	12	4.3		7	5.6	5	3.3
A plant	23	8.3		8	6.4	15	9.8
An animal	31	11.2		21	16.8	10	6.5
Colony of organisms	122	43.9		58	46.4	64	41.8
Don't know	10	3.6		1	0.8	9	5.9
Total	278	100		125	100	153	100

When respondents were asked where corals get their color from, most of them answered from 'minerals' (44.2%). Twenty percent replied from 'other organisms' and 15.2% answered from 'the sun'. Few individuals believed corals to get their color from 'dyes in the water' (2.8%) or from surrounding rocks (1.4%). Nearly 16% did not know where corals get their color (Table 6). There was a significant difference between the respondents of the WITHOUT and WITH groups (chi-square test, df=5, p=0.004, n=285; contingency table=6 responses vs. 2 groups (with/without)). In the chi-square analysis four cells have counts fewer than five (33.3%). When the two smallest categories ('dyes' and 'surrounding rocks') were removed from the analysis there were no cells with counts fewer than five and the result was still significantly different (chi-square test, df=4, p=0.001, n=268; contingency table=5 responses vs. 2 groups (with/without)).

Table 6. Where respondents believe coral gets its color from. The left half of the table shows all respondents (n=268) while the right half shows the distribution of the respondents in the WITHOUT group (n=123) and the WITH group (n=145) separately.

Coral gets its color from? (multiple answers permitted)	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
The sun	44	15.4		32	23.9	12	7.9
Other organisms	58	20.4		25	18.7	33	21.9
Dyes (colors) found in the water	8	2.8		4	3.0	4	2.6
Surrounding rocks	4	1.4		1	0.7	3	2.0
Minerals	126	44.2		58	43.3	68	45.0
Don't know	45	15.8		14	10.4	31	20.5
Total	285	100		134	100	153	100

Table 7 shows that the main reasons for coral damage can be attributed to ‘pollution’ (21.7%), ‘boats running into corals’ (19.5%), ‘snorkeler/diver contact’ (18.2%) ‘climate change’ (17.9%) and ‘dynamite fishing’ (17.5%). Less mentioned reasons include ‘fish damaging corals’ (2.3%) and ‘crown of thorns damaging’ corals (2%). Only 10 individuals did not know the answer to this question (1%). There was no significant difference between the respondents of the WITHOUT and WITH groups (chi-square test, df=8, p=0.96, n=263; contingency table=9 responses vs. 2 groups (with/without)).

Table 7. What respondents believe can damage corals. The left half of the table shows all respondents (n=263) while the right half shows the distribution of the respondents in the WITHOUT group (n=122) and the WITH group (n=141) separately.

Corals can suffer damage from? (multiple answers permitted)	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Snorkeler/diver contact	186	18.2		93	18.8	93	17.6
Climate change	183	17.9		97	17.3	86	18.4
Pollution	222	21.7		119	20.8	103	22.5
Fish	24	2.3		10	2.8	14	1.9
Boats running into corals	200	19.5		106	19.0	94	20.1
Crown of thorns	20	2.0		9	2.2	11	1.7
Dynamite fishing	179	17.5		89	18.1	90	16.9
Don’t know	10	1.0		5	1.0	5	0.9
Total	1024	100		528	100	496	100

Numerous organisms are alive on a reef. Respondents had varied responses to the various items alive on a reef as depicted in Table 8. ‘Rocks’ appear to be mentioned only as a minority as being alive (2.9%), however, 33 different respondents mentioned it. The remaining items were (listed in order of frequency by respondents): ‘corals’ (21.0%), ‘sponges’ (18.1%), ‘anemones’ (17.2%), ‘algae’ (15.9%), ‘seaweed’ (14.1%) and ‘shells’ (10.8%). There was no significant difference between the respondents of the WITHOUT and WITH groups (chi-square test, df=6, p=0.98, n=259; contingency table=7 responses vs. 2 groups (with/without)).

Table 8. The items respondents believe to be alive on a reef. The left half of the table shows all respondents (n=259) while the right half shows the distribution of the respondents in the WITHOUT group (n=121) and the WITH group (n=138) separately.

Which items are alive on a reef? (multiple answers permitted)	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Algae	180	15.9		83	15.5	97	16.2
Coral	238	21.0		115	21.5	123	20.5
Sponges	205	18.1		95	17.8	110	18.4
Anemones	195	17.2		95	17.8	100	16.7
Rocks	33	2.9		17	3.2	16	2.7
Seaweed	160	14.1		71	13.3	89	14.9
Shells	123	10.8		59	11.0	64	10.7
Total	1134	100		535	100	599	100

Most respondents believed corals to be living organisms (90.6%), and this was similar in both the WITHOUT (96.0%) and WITH (92.4%) groups (no significant difference between the two groups; chi-square test, df=1, p=0.90, n=256; contingency table=2 responses vs. 2 groups (with/without)). However, there were 12 respondents (4.3%) who did not answer this question (2.4% of the WITHOUT group and 6.2% of the WITH group). The remaining minority believed corals to be ‘non-living matter’. Of those respondents who believed corals to be living organisms, 44.7% believed corals to grow at a rate expressed by ‘mm’s per year’ and 23.0% thought corals to grow at a rate expressed by ‘cm’s per year’. A third (30.4%) of all respondents were not able to approximate the growth rate of corals. Two respondents believed corals to grow at a rate of ‘meters per year’ while one respondent felt corals grew ‘hundreds of meters per year’. Two respondents thought corals were living organisms that ‘did not grow’. This data is depicted in Table 9. There was no significant difference between respondents of the WITHOUT and WITH groups (chi-square test, df=5, p=0.52, n=257; contingency table=6 responses vs. 2 groups (with/without)). However, the statistical analysis did not yield any usable results due to the large contingency table and low representation of counts within most of the cells. When the three smallest responses (‘do not grow’, ‘m’s per year’ and ‘100’s of m’s per year’) were omitted from the analysis, all cells in the analysis had more than five counts (statistical analysis is usable) and the result was still non-significant (chi-square test, df=1, p=0.52, n=252; contingency table=2 responses vs. 2 groups (with/without)).

Table 9. The amount of growth corals have per year as described by the respondents. The left half of the table shows all respondents (n=257) while the right half shows the distribution of the respondents in the WITHOUT group (n=119) and the WITH group (n=138) separately.

Coral growth is best expressed by:	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
They do not grow	2	0.8		0	0.0	2	1.4
mm's per year	115	44.7		56	47.1	59	42.8
cm's per year	59	23.0		29	24.4	30	21.7
m's per year	2	0.8		1	0.8	1	0.7
100's of m's per year	1	0.4		1	0.8	0	0.0
Don't know	78	30.4		32	26.9	46	33.3
Total	257	100		119	100	138	100

Summary-Respondents Knowledge

From the results portrayed above it is evident that respondents from the WITHOUT and WITH groups have similar knowledge levels. The two questions that indicated that the groups were different (description of corals and color of corals) were due to differences in the minorities as the answer options that attracted most of the responses were similar for both groups. The difference between the WITHOUT and WITH groups for the question asking for the description of corals was due to the answer option 'corals are animals'. The question that asked where corals get their color from was answered incorrectly by most respondents and as such it is fair to attach less importance to this question when comparing the overall knowledge score of the WITHOUT and WITH group respondents. Each respondent was given a knowledge score based on the correct answers they gave for all the questions. When the total knowledge score of the WITHOUT respondents (average score was 68%) was compared to the total knowledge score of the WITH respondents (average score was 60%) the difference was non-significant (independent samples t-test, p=0.084). Overall the respondents know that corals are living organisms (98%), grow either mm's or cm's per year (68%), are the main building blocks of reefs (68%) and that corals are best described as a colony of organisms (44%). There are a few misconceptions such as: most respondents (44%) believe 'minerals' to be the main source of color for corals, and most people do not know certain 'fish' (91%) and 'crown of thorns' (92%) predate on corals.

Respondent's Visit to the Mombasa Marine Park and Reserve

Respondents were asked if this was their first visit to the Mombasa Marine Park and Reserve and the majority answered this question with 'yes' (87%). Thirteen percent of the respondents had been to the park previously (there was no significant difference between the WITHOUT and WITH group respondents; chi-square test, df=1, p=0.534, n=237; contingency table=2 responses vs. 2 groups (with/without)). Table 10 indicates the source(s) of information used by respondents to gather information about the Mombasa Marine Park and Reserve. Nearly a quarter of respondents did not gather any information about the park prior to the snorkel excursion. Of those respondents that did obtain information, word of mouth was the most dominant (either via hotel staff, people on the beach or friends and relatives). Other methods of sourcing information included the tour representative (indicated as ‘Tour REP’ in the table), a guidebook or the internet. The Mombasa Marine Park and Reserve brochure was barely used to source information and media (radio, TV or newspapers) was never used. There was no significant difference between the WITHOUT and WITH group respondents (chi-square test, df=9, p=0.241, n=244; contingency table=10 responses vs. 2 groups (with/without)).

Table 10. Sources of information used by respondents (multiple answers were allowed). The left half of the table shows all respondents (n=244) while the right half shows the distribution of the respondents in the WITHOUT group (n=115) and the WITH group (n=129) separately.

Source of information	Total		WITHOUT GROUP	WITH GROUP
	%		%	%
Did not obtain any	23		21.7	23.8
Mombasa Marine Park Brochure	4		2.6	5.5
Beach person	14		18.4	9.8
Radio/TV/Newspaper	0		0.0	0.0
Internet	8		8.6	7.3
Friends/relatives	14		9.9	17.1
Tour REP	10		10.5	9.8
Guidebook	8		8.6	7.3
Hotel staff	15		15.8	13.4
Other	5		3.9	6.1

Most of the respondents partook in a snorkeling excursion with either their ‘partner’ or ‘family’ (36.4% and 31.0% respectively). The next substantial group that respondents went snorkeling with in the park was ‘friends’ (19.5%). Other smaller groups included ‘organized group’, ‘business associates’ or ‘I am alone’ (Table 11). Statistical analysis was attempted on this data but due to the large contingency table and low representation of counts within most of the cells the statistical tests did not yield any usable results.

Table 11. Type of group(n= the respondents were with during their snorkel excursion. The left half of the table shows all respondents (n=243) while the right half shows the distribution of the respondents in the WITHOUT group (n=113) and the WITH group (n=129) separately.

Type of group	Total		WITHOUT GROUP	WITH GROUP
	%		%	%
I am alone	2.7		3.5	2.1
With my partner	36.4		41.7	32.2
With my family	31.0		23.5	37.0
With friends	19.5		24.5	15.8
Organized group	7.3		3.5	10.3
Business Associates	1.5		0.0	2.7
Other	1.5		3.5	0.0

Table 12 shows that half of the respondents went on the snorkeling excursion in a group comprised of two persons. The next two sizable groups consisted of three and four people (10.6% and 18.0% respectively). Group sizes bigger than four persons, and solitary individuals were low in abundance on snorkeling excursions in the Mombasa Marine Park and Reserve. Two respondents did not indicate their group size. Statistical analysis was attempted on this data but due to the large contingency table and low representation of counts within most of the cells the statistical tests did not yield any usable results.

Table 12. Number of people in the direct group (not the entire boat) of the respondent (including the respondent). The left half of the table shows all respondents (n=243) while the right half shows the distribution of the respondents in the WITHOUT group (n=114) and the WITH group (n=129) separately.

Number of people in group	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
1 person	7	2.9		4	3.4	3	2.3
2 persons	120	49.0		65	56.0	55	42.6
3 persons	26	10.6		10	8.6	16	12.4
4 persons	44	18.0		23	19.8	21	16.3
5 persons	15	6.1		2	1.7	13	10.1
6-9 persons	22	9.0		9	7.8	13	10.1
>10 persons	9	3.7		1	0.9	8	6.2
No response	2	0.8		2	1.7	0	0.0
Total	245	100		116	100	129	100

Whereas Table 12 shows the group size of respondents, Table 13 indicates the number of people on a snorkel boat. Most of the respondents (43.7%) indicated that they were on a boat with 6-10 persons (excluding the crew). A similar amount of people (40.0%) stated that there were five persons or fewer on their excursion. Group sizes bigger than 10 persons were not common. There was no significant difference between the WITHOUT and WITH group respondents (chi-square test, df=3, p=0.975, n=245: contingency table=4 groups of sizes vs. 2 groups (2with/without)).

Table 13. Number of people on the snorkel boat (excluding crew). The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Number of people on boat	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
≤5 people	98	40.0		48	41.4	50	38.8
6-10 people	107	43.7		50	43.1	57	44.2
11-15 people	18	7.3		8	6.9	10	7.8
>15 people	22	9.0		10	8.6	12	9.3
Total	245	100		116	100	129	100

Respondents were presented with 15 possible reasons for partaking in the snorkeling excursion and they were asked to indicate on a five-point scale the importance of each of these reasons. Table 14 presents the 15 reasons for coming on a snorkeling excursion and indicates the mean score for each of these reasons. The top five reasons for coming on the snorkel excursion included: ‘experiencing the beauty of nature’, ‘being in a natural place’, ‘learning more about nature’, ‘learning more about coral reefs’, and ‘experiencing something new and different’. The five least important reasons included: ‘being alone’, ‘meeting new people’, ‘getting exercise’, ‘developing skills’ and ‘being with like-minded others’. There was no significant difference between the WITHOUT and WITH group respondents for all of the reasons except for the reason of ‘to develop skills’ (chi-square test, df=4, p>0.05 and p=0.007 for the reason ‘to develop skills’, n=244; contingency table=5-scaled responses vs. 2 groups (with/without)). The WITH group felt that ‘to develop skills’ was more important than those in the WITHOUT group.

Table 14. The importance of reasons respondents had for partaking in the snorkel excursion (listed from most important to least important). The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

	Total (n=245)	WITHOUT GROUP (n=116) % of respondents per category*						WITH GROUP (n=129) % of respondents per category*					
Reason for visit	Mean*	Mean*	1	2	3	4	5	Mean*	1	2	3	4	5
Experience the beauty of nature	4.8	4.8	83.5	14.8	0.9	0.9	0.0	4.8	82.8	15.6	0.8	0.8	0.0
Be in a natural place	4.6	4.6	68.8	29.8	3.5	0.9	0.0	4.6	66.4	26.6	6.3	0.0	0.8
Learn more about nature	4.5	4.4	51.3	38.1	9.7	0.9	0.0	4.5	61.7	30.5	5.5	1.6	0.8
Experience something new and different	4.5	4.5	53.5	33.3	7.9	0.9	0.0	4.6	68.8	23.4	4.7	1.6	1.6
Learn about a coral reef	4.4	4.4	50.9	39.5	7.0	0.9	1.8	4.5	60.2	33.6	3.1	3.1	0.0
Experience undeveloped environment	4.3	4.2	46.8	34.9	14.7	2.8	0.9	4.4	51.2	35.0	12.2	1.6	0.0
Have some excitement	4.1	4.0	34.9	43.1	12.8	4.6	4.6	4.3	43.3	44.1	8.7	2.4	1.6
Escape the normal routine	4.1	4.1	39.8	35.9	15.5	7.8	1.0	4.1	43.0	30.6	17.4	7.4	1.7
Be close to friends or family	4.0	4.0	37.5	34.4	16.7	9.4	2.1	4.0	43.7	29.4	16.8	5.9	4.2
Rest and relax	3.8	3.7	27.2	42.7	14.6	7.8	7.8	3.9	34.7	33.1	19.8	9.9	2.5
Be with others who enjoy things that I enjoy	3.8	3.6	23.6	37.7	21.7	10.4	6.6	3.9	28.6	43.7	42.9	6.7	3.4
Develop skills	3.5	3.3	10.8	35.3	32.4	12.7	8.8	3.8	28.6	33.6	26.1	9.2	2.5
Get some exercise	3.4	3.2	12.6	37.9	18.4	19.4	11.7	3.5	20.5	35.9	24.8	11.1	7.7
Meet new people	3.1	3.0	7.8	31.1	32.2	14.4	14.4	3.2	13.7	28.2	33.3	13.7	11.1
To be alone	2.3	2.2	1.5	11.9	29.9	19.4	37.3	2.4	4.3	8.7	37.7	18.8	30.4

**1=very unimportant, 2=slightly unimportant, 3=neutral, 4=slightly important and 5=very important*

Respondents were also asked to rate six marine park attributes on a seven-point scale from very unimportant to very important. These resulted are shown in Table 15. The mean score for each attribute is shown along with the percent of respondents that scored each category for the WITHOUT and WITH groups. The 'absence of rubbish' was the most important aspect when visiting a marine park (score of 6.7 out of 7). 'Receiving information on marine life' and the 'behavior of other visitors' scored next highest of the six attributes (both on 6.4 out of 7). 'Not too many people', 'presence of rangers' and 'availability of pre-visit information on the park' were the remaining three attributes scored (6.1, 6.1, and 5.9 out of 7 respectively). There was no significant difference between the WITHOUT and WITH group respondents for all of the park attributes except for the park attribute of 'not too many people' (chi-square test, df=6, $p>0.05$ and $p=0.044$ for the differing attribute, n=237; contingency table=7-scaled responses vs. 2 groups (with/without)).

Table 15. The importance of marine park attributes to the respondents when visiting a marine park. The left half of the table shows all respondents (n=237) while the right half shows the distribution of the respondents in the WITHOUT group (n=110) and the WITH group (n=127) separately.

Park Attribute	Total (n=237)	WITHOUT GROUP (n=110)						WITH GROUP (n=127)					
	Mean*	Mean*	% of respondents per category* 1-2	3	4	5	6-7	Mean*	% of respondents per category* 1-2	3	4	5	6-7
Absence of rubbish	6.7	6.4	90.0	9.1	0.9	0.0	0.0	6.3	85.8	10.2	3.1	0.0	0.8
Information on marine life	6.4	6.8	98.1	0.0	1.9	0.0	0.0	6.6	94.5	1.6	1.6	0.0	2.4
Behavior of other visitors	6.4	6.2	81.5	13.0	3.7	0.9	0.9	6.1	78.0	13.4	7.1	0.8	0.8
Not too many people	6.1	6.3	86.1	8.3	4.6	0.0	0.9	6.0	75.6	15.0	6.3	1.6	1.6
Presence of rangers	6.1	6.6	93.6	4.6	0.9	0.0	0.9	6.3	86.6	7.1	3.9	1.6	0.8
Availability of pre-visit info on park	5.9	5.9	69.4	21.3	6.5	2.8	0.0	5.9	70.9	20.5	7.9	0.0	0.8

**1=very unimportant, 2=unimportant, 3=slightly unimportant, 4=neutral, 5=slightly important, 6=important and 7=very important*

Summary-Respondent's Visit to the Mombasa Marine Park and Reserve

There are some differences between the WITHOUT and WITH group respondents. The snorkel companions of the WITHOUT and WITH group differed significantly, however, the three main types of companions in both groups were similar (family and/or friends), comparable to results on snorkelers on the Great barrier Reef, Australia (1998) . The number of people within a private group also differed between the two groups but here again it is evident that groups of 2-4 persons were the most dominant in both groups. Participants rated ‘experiencing the beauty of nature’ as the most important reason for coming on this excursion. The only reason for coming on the snorkeling excursion that differed between the WITHOUT and WITH groups was ‘to develop skills’. This reason ranked 12th of all 15 reasons for both groups even though the average scores differed between the groups. These results were similar to those found in the afore mentioned study on snorkelers on the Great Barrier Reef (Shafer et al., 1998). The final difference between the two groups was one of the marine park attributes: ‘not too many people’. Since this question was on the post-excursion questionnaire (completed after the excursion) the excursion may have influenced the response of the respondents. The WITH interpretation group ranked this question lower than the WITHOUT interpretation group. The teachings of the interpretation program that was implemented by guides of the snorkel excursion explained that guides should avoid crowding and give each other (the other guides) space when they embark on a snorkel excursion. These teachings could have been implemented and respondents from the WITH group may have been less crowded and therefore attached less importance to it than their counterparts in the WITHOUT group who may have been crowded. Examining the afore mentioned reasons it is still plausible to treat the WITHOUT and WITH groups as similar when it comes to the average visitor to the Mombasa Marine Park and Reserve.

Being able to understand the motivations visitors have about visiting a park and what these visitors attach importance to are vital pieces of information for park managers in ensuring these desires are met (Archer and Griffin, 2004, Archer and Griffin, 2005). Furthermore this knowledge can be used to streamline the parks resources to meet the expectations of the visitors. It is also important to be aware of whether visitors are first time visitors or repeat visitors, as first time visitors will most likely seek out more information and this will need to be made available to them (Archer and Griffin, 2004).

The average snorkeler in the Mombasa Marine Park and Reserve was a first time visitor to the park (similar to visitors in some Australian terrestrial parks (Wearing et al., 2008)) and did not obtain any information about the park prior to the snorkel excursion. Those visitors that did gather information about the park did so via word of mouth (people on the beach, hotel staff, friends or family). Very little use was made of the internet, guidebooks or the park brochure. This sourcing of information is similar to studies conducted in Australian terrestrial parks by Wearing (2008) and to a lesser extent by Archer (2004). Most visitors engaged in snorkel excursions with their partner, family and/or friends. This type of group composition was also found by Archer (2004) and Griffin (2005) in national parks in New South Wales, Australia. These family and/or friend groups were mostly composed of two persons but groups of three and four persons were also frequently observed. Most of the snorkel boats that conducted snorkel excursions during the study period had either five or fewer persons on board, or six to 10 persons on board. The majority of the former option consisted of four to five persons (den Haring pers obs). So even though most of the visitor groups were small (2-4 persons), multiple groups were mixed together on a single snorkel excursion (4-10 persons). Offering private excursions (one boat to take single groups of 2-3 persons) could be a market opportunity for the snorkel industry.

Reasons visitors had for coming on a snorkel excursion were mainly influenced by nature, the beauty of nature, or a desire to learn more about nature. These reasons indicate that a pristine environment paired with a learning environment is important to snorkeling visitors frequenting the Mombasa Marine Park and Reserve. Respondents scored general marine park attributes highly. Even though this question pertained to marine parks in general, responses could have been influenced by the experience of respondents in the Mombasa Marine Park and Reserve on the day they completed their questionnaire (the questionnaire was completed at the end of the excursion). The highest scoring attribute, absence of rubbish, was also found by Archer (2005) to be the top attribute of a terrestrial park in Australia (Mungo National Park, New South Wales). What stands out in this study is that most visitors did not seek out information prior to their snorkel excursion and this also ranked lowest of marine park attributes. Perhaps visitors expect information to be made readily available to them rather than them having to expend efforts to track it down. This finding also indicates that Mombasa Marine Park and Reserve brochures need to be more readily available for visitors to scan as very few respondents sourced information from the Mombasa Marine Park brochure (only 10 out of 245 respondents indicated to having used the brochure). The second lowest ranking marine park attribute was the presence of rangers, a result shared by Archer (2004) and Griffin (2005) in terrestrial parks in Australia (New South Wales).

Snorkel Experience

A quarter of the respondents (24.5%) indicated that their snorkel excursion in the Mombasa Marine Park and Reserve was their first ever snorkel experience. A similar amount (26.9%) stated that they had been snorkeling for more than 10 years. The remaining half of the respondents had snorkel experience that ranged from less than a year to 10 years, and most had 2-3 years experience (14.7%). These results are depicted in Table 16. There was no significant difference between the WITHOUT and WITH group respondents (chi-square test, df=4, p=0.477, n=236; contingency table=5 responses vs. 2 groups (with/without)).

Table 16. The number of years the respondents have been snorkeling. The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Years of snorkeling	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
First time	60	24.5		25	21.6	35	27.1
< 1 year	26	10.6		13	11.2	13	10.1
2-3 years	36	14.7		14	12.1	22	17.1
4-6 years	23	9.4		13	11.2	10	7.8
7-10 years	25	10.2		10	8.6	15	11.6
>10 years	66	26.9		35	30.2	31	24.0
No response	9	3.7		6	5.2	3	2.3
Total	245	100		116	100	129	100

Respondents were also asked to state how important snorkeling is to them (Table 17) and most of the respondents answered that snorkeling is ‘one of many activities they engage in’ (64.5%). A small minority (6.5%) listed it as their ‘most important activity’ while 18 percent said it was ‘not at all important’. Six respondents did not answer this question. There was no significant difference between the WITHOUT and WITH group respondents (chi-square test, df=3, p=0.496, n=239; contingency table=4 responses vs. 2 groups (2=with/without)).

Table 17. The importance of snorkeling as an activity to the respondents. The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Importance of snorkeling	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Most important activity	16	6.5		8	6.9	8	6.2
Second most important activity	21	8.6		12	10.3	9	7.0
One of the many activities I do	158	64.5		68	58.6	90	69.8
Not at all important	44	18.0		23	19.8	21	16.3
No response	6	2.4		5	4.3	1	0.8
Total	245	100		116	100	129	100

Table 18 shows that most of the respondents took 'one', or 'less than one', holiday per year with a snorkeling option (38.4% and 39.6% respectively). The next biggest group (15.5%) stated that a holiday with a snorkeling option was taken 'every 2-3 years'. Eight respondents left this question unanswered. There was no significant difference between the WITHOUT and WITH group respondents (chi-square test, df=3, p=0.074, n=237; contingency table=4 responses vs. 2 groups (with/without)).

Table 18. The number of holidays taken by respondents where snorkeling is an option. The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Snorkeling holidays per year	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
More than 3x per year	8	3.3		1	0.9	7	5.4
2-3x per year	38	15.5		23	19.8	15	11.6
1x per year	94	38.4		43	37.1	51	39.5
<1 per year	97	39.6		43	37.1	54	41.9
No response	8	3.3		6	5.2	2	1.6
Total	245	100		116	100	129	100

Most of the respondents stated that they most often snorkel with 'family' and 'friends' (Table 19, family only: 46.5%, friends only 25.3%; and family/friends combination 13.1%). Snorkeling by 'oneself' was stated to be the preferred choice by 9.4% of the respondents while snorkeling with a 'snorkel club' was the least favorite (1.2%). Eleven respondents did not answer this question. There was no significant difference between the WITHOUT and WITH group respondents (chi-square test, df=4, p=0.518, n=234; contingency table=5 responses vs. 2 groups (with/without)).

Table 19. The people the respondents snorkel with most often. The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

Snorkel with most often	Total			WITHOUT GROUP		WITH GROUP	
	n	%		n	%	n	%
Family	114	46.5		48	41.4	66	51.2
Friends	62	25.3		33	28.4	29	22.5
Yourself	23	9.4		13	11.2	10	7.8
Family and Friends	32	13.1		14	12.1	18	14.0
Club	3	1.2		1	0.9	2	1.6
No response	11	4.5		7	6.0	4	3.1
Total	245	100		116	100	129	100

Respondents were also asked to rate the reef of the Mombasa Marine Park and Reserve to other reefs they have seen while snorkeling. Table 20 depicts these results. Most of the respondents were first-time snorkelers (32.7%) and could not make this comparison. Of the remaining respondents 30.2% stated that they rated the other reefs ‘better’ than the Mombasa reef. Only 13.5% rated the Mombasa reef better than other reefs they have seen while 22.4% stated that the Mombasa reef was equal to other reefs. There was a significant difference between the WITHOUT and WITH group respondents (chi-square test, df=3, p=0.032, n=232; contingency table=4 responses vs. 2 groups (with/without)).

Table 20. The respondent’s opinion of how the reefs in the Mombasa Marine Park and Reserve compare to other reefs they have visited. The left half of the table shows all respondents (n=245) while the right half shows the distribution of the respondents in the WITHOUT group (n=116) and the WITH group (n=129) separately.

How does Mombasa Marine Park compare to other reefs	Total		WITHOUT GROUP		WITH GROUP	
	n	%	n	%	n	%
Better than other reefs	33	13.5	16	13.8	17	13.2
Same as other reefs	55	22.4	28	24.1	27	20.9
Not as good as other reefs	74	30.2	42	36.2	32	24.8
First reef I have seen	80	32.7	27	23.3	53	41.1
No response	3	1.2	3	2.6	0	0.0
Total	245	100	116	100	129	100

Summary-Snorkel Experience

There is only one difference between the WITHOUT and WITH group respondents and this is regarding their experience of the reef in the Mombasa Marine Park and Reserve. The remaining factors describing their snorkel behavior (experience, importance of snorkeling, holidays, and snorkel companions) showed no difference between the WITHOUT group and the WITH group. Therefore any descriptions of the average snorkeler in the Mombasa Marine Park and Reserve can be based on combining the two groups into one combined group.

The average snorkeler in the Mombasa Marine Park and Reserve was either a complete novice (first time snorkeling) or had been snorkeling for more than 10 years, and considers snorkeling one of many activities that they participate in. When these visitors go snorkeling they most often do so with family and/or friends, and they take a holiday with a snorkeling option either once per year or less than once per year. Most of the snorkelers that have snorkeled before rated the reefs of the Mombasa Marine Park and Reserve less than other reefs they have seen. Only a small portion of the respondents that had snorkeled before rated the Mombasa reef better than other reefs they have seen. This result indicates that the guides of the snorkel excursions will need to highlight various aspects of the Mombasa Marine Park reef and transfer a sense of appreciation to their snorkeling clients. The reefs of the Mombasa Marine Park and Reserve will not sell themselves, however, an enjoyable and educative experience (a desire indicated by the respondents) could still be presented to the visitors.

Conclusion

The survey respondents in this study exhibited similar socio-demographic characteristics that were similar to visitors of national parks in Australia and overseas (Archer and Griffin, 2004, Archer and Griffin, 2005, Wearing et al., 2008). The characteristics of snorkeling visitors to the Mombasa Marine Park and Reserve described within this study are essential to the various stakeholders involved in the snorkel industry. These stakeholders include the marine park management authority (the Kenya Wildlife Service), the snorkel operators, the hoteliers and the tour companies that cater to the visiting snorkelers. This data can be used by the various stakeholders to determine if a) the marine park is meeting the needs of the visiting snorkeler, and b) if the visiting snorkeler was satisfied with the experience they had.

The Mombasa Marine Park and Reserve can be characterized as a park that attracts small groups of families and/or friends for snorkeling activities. Most of the visitors to the park who engage in snorkeling activities are of European origin and their main language is their country's national language. The pristine environment within the park is what these visitors wish to experience. Most of these snorkeling visitors find it important to receive information about the nature within the park as they have indicated a desire to learn. The knowledge scores of respondents indicate that the visitors to the Mombasa Marine Park and Reserve should strive to improve their knowledge of marine ecosystems. There existed several misconceptions in certain aspects of their knowledge of marine ecosystems and overall there was room for improvement. The fact that these visitors have already expressed a desire to learn more about nature and corals means that they are ready for more information. This desire to learn has been validated in numerous previous studies (Luck, 2003, Aiello, 1998) as resource visitors: "are an audience ripe for education programs" (Jacobson and Marynowski 1997, p. 779).

Being able to understand who the recreational resource user is within a protected area will allow various stakeholders to ensure that needs of recreational resource users are being met. Satisfied visitors have been found to conform more than unsatisfied visitors to park rules and regulations (Wearing et al., 2008, McArthur, 1994). This knowledge will then ensure that the protection aspect of the park is met more effectively. Satisfied clients will require fewer financial resources to monitor for the above stated reason and hence more financial resources are available for other aspects of the park. Managing the impacts of visitors while ensuring a quality experience for those visitors is a challenge faced by park managers (Manfredo and Bright, 1991). However, another viewpoint could be that impacts of visitors are easier to manage if those visitors are satisfied.

Appendix 4: The Survey Tools

Scuba Diving Monitoring Slate Template

Dive Site: Visibility: Date: Current Strength: Dive 1 or 2 : Current Direction: DM Leading: Sky Coverage: Surge:			Actions																	
Diver (describe by identifying marks)	Dive Start	Dive Finish	1^{st} 15 minutes						2^{nd} 15 minutes						3^{rd} 15 minutes					
			AI	AN	DI	DN	Silt	Near	AI	AN	DI	DN	Silt	Near	AI	AN	DI	DN	Silt	Near
1.																				
2.																				
3.																				
4.																				
5.																				
6.																				
7.																				
8.																				
9																				
10.																				
11.																				
12.																				
13.																				
Diver or Guide			AI=alive intentional, AN=alive non-intentional, DI=dead intentional, DN=dead non-intentional, Silt=siltation, near=with 10 cm																	

Snorkeling Monitoring Slate Template

<table>
<tr><td colspan="4">Location: Visibility:
Date: Current:
Low Tide: Sky Coverage:</td><td colspan="7">Actions</td></tr>
<tr><td>Snorkeler (describe by identifying marks)</td><td>Glass Boat</td><td>Snorkel Start</td><td>Snorkel Finish</td><td>Intentional</td><td>Non-intentional</td><td>Siltation</td><td>Wildlife Interaction</td><td>Standing Comfortably</td><td>Standing Uncomfortably</td><td>Seagrass</td></tr>
<tr><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>6.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>8.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>11.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>12.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>13.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>14</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>15.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Snorkeler or Guide</td><td></td><td></td><td></td><td>Scored – for alive and | for dead</td><td>Scored – for alive and | for dead</td><td></td><td></td><td>Scored – for alive and | for dead</td><td>Scored – for alive and | for dead</td><td>Scored – for comfortable and | for uncomfortable</td></tr>
</table>

Scuba Divers Elicitation Survey

A. Behavioral Beliefs

1. What do you see as the advantages or good things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?
2. What do you see as the disadvantages or bad things that could result if you do not get close (~10cm) to the living reef (corals and other living organisms) today?

B. Normative Beliefs

a. Injunctive norms: *If you considered not getting close (~10cm) to the living reef (corals and other living organisms) today, there might be certain individuals or groups (you know, people important to you and whose opinion actually matters) that would think you either should or should not do it.*

1. Who are the people or groups who would approve of, or who would encourage you, not to get close (~10cm) to the living reef (corals and other living organisms)?
2. Who are the people or groups who would disapprove of, or who would discourage you, from not getting close (~10cm) to the living reef (corals and other living organisms)?

b. Descriptive norms: *Sometimes, when we are not sure what to do in a particular situation, we look to see what other people are doing. When it comes to not getting close (~10cm) to the living reef (corals and other living organisms) today, please list the individuals or groups whose own behavior you might look to for guidance.*

1. Which of these people is most likely to not get close (~10cm) to the living reef (corals and other living organisms) today?
2. Which of these people is least likely to not get close (~10cm) to the living reef (corals and other living organisms) today?

C. Control Beliefs

1. Please list any factors or circumstances that would make it easy or enable you to not get close (~10cm) to the living reef (corals and other living organisms) today.
2. Please list any factors or circumstances that would make it difficult or prevent you to not get close (~10cm) to the living reef (corals and other living organisms) today.

Scuba Divers Salient Beliefs Questionnaire

JAMES COOK UNIVERSITY AUSTRALIA

RECREATIONAL RESOURCE USE SURVEY MOMBASA MARINE PARK AND RESERVE, KENYA

The following questions focus on how visitors use the reef in the Mombasa Marine Park and Reserve. When questions refer to your use of the reef, please think only of your experience here today. Please know that there are no right or wrong answers to the following questions, nor are some responses better or worse than others. Park managers simply want to know your honest opinions about using the reef.

-BE SURE TO ANSWER ALL QUESTIONS-DO NOT OMIT ANY

-NEVER MARK MORE THAN ONE ANSWER

1. **This question seeks to find out what YOU believe about using the reef in the Mombasa Marine Park and Reserve.**

	TOTALLY AGREE	GENERALLY AGREE	MILDLY AGREE	NEITHER AGREE NOR DISAGREE	MILDLY DISAGREE	GENERALLY DISAGREE	TOTALLY DISAGREE
If I NEVER GO NEAR THE REEF (within 10cm) WHEN SCUBA DIVING, then I will protect the reef (and ecosystem).	O	O	O	O	O	O	O
If I NEVER GO NEAR THE REEF (within 10cm) WHEN SCUBA DIVING, then I will not be able to see as much on the reef.	O	O	O	O	O	O	O

2. **Protecting the reef (and ecosystem) when scuba diving is:** ***(circle the number that best describes your opinion)***

GOOD	1	2	3	4	5	6	7	BAD
	extremely	quite	slightly	neither	slightly	quite	extremely	

3. **Not seeing as much on the reef when scuba diving is:** ***(circle the number that best describes your opinion)***

GOOD	1	2	3	4	5	6	7	BAD
	extremely	quite	slightly	neither	slightly	quite	extremely	

4. When it comes to NOT GOING NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park, how much do you want to be like your dive guide (divemaster leading the dive)?

I want to be like this person VERY MUCH	I WOULD LIKE IT	JUST A LITTLE	I'M NOT BOTHERED EITHER WAY	NOT REALLY	I WOULD NOT LIKE IT	I want to be like this person NOT AT ALL
O	O	O	O	O	O	O

5. The following set of statements relate to the EASE or DIFFICULTY of NOT GOING NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park.

	STRONGLY AGREE	GENERALLY AGREE	MILDLY AGREE	NEITHER AGREE NOR DISAGREE	MILDLY DISAGREE	GENERALLY DISAGREE	STRONGLY DISAGREE
Having buoyancy control would enable me to NOT GO NEAR THE REEF (within 10cm).	O	O	O	O	O	O	O
I have control of my buoyancy to NOT GO NEAR THE REEF (within 10 cm) when scuba diving	O	O	O	O	O	O	O
I am confident that I will NOT GO NEAR THE REEF (within 10cm) while scuba diving in the Mombasa Marine Park.	O	O	O	O	O	O	O

6. Most people that are important to me think that I should NOT GO NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park. ***(circle the number that best describes your opinion)***

AGREE :___1___:___2___:___3___:___4___:___5___:___6___:___7___: DISAGREE

completely quite slightly neither slightly quite completely

7. For me to NOT GO NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park is: ***(please answer each line by circling the number that best describes your opinion)***

HARMFUL :__7__:__6__:__5__:__4__:__3__:__2__:__1__: BENEFICIAL

PLEASANT :__1__:__2__:__3__:__4__:__5__:__6__:__7__: UNPLEASANT

GOOD :__1__:__2__:__3__:__4__:__5__:__6__:__7__: BAD

WORTHLESS:__7__:__6__:__5__:__4__:__3__:__2__:__1__: VALUABLE

ENJOYABLE :__1__:__2__:__3__:__4__:__5__:__6__:__7__: UNENJOYABLE

8. How likely is it that the following groups of people will NOT GO NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park.

	EXTREMELY LIKELY that this group will **not** go near the reef	GENERALLY LIKELY	MILDLY LIKELY	NEITHER LIKELY NOR UNLIKELY	MILDLY UNLIKELY	GENERALLY UNLIKELY	EXTREMELY UNLIKELY that this group will **not** go near the reef
All dive guides (divemaster leading the dive)	O	O	O	O	O	O	O
Dive guides that I respect	O	O	O	O	O	O	O

9. Most people whose opinions I value would approve of me NOT GOING NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park. ***(circle the number that best describes your opinion)***

DISAGREE	7	6	5	4	3	2	1	AGREE
	completely	quite	slightly	neither	slightly	quite	completely	

10. The dive guide (divemaster leading the dive) thinks that I should NOT GO NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park. ***(circle the number that best describes your opinion)***

AGREE	1	2	3	4	5	6	7	DISAGREE
	completely	quite	slightly	neither	slightly	quite	completely	

11. When it comes to NOT GOING NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park, doing what the dive guide thinks I should do is:

VERY IMPORTANT TO ME	IMPORTANT TO ME	MILDLY IMPORTANT TO ME	NEITHER IMPORTANT NOR UNIMPORTANT TO ME	MILDLY UNIMPORTANT TO ME	UNIMPORTANT TO ME	VERY UNIMPORTANT TO ME
O	O	O	O	O	O	O

12. The final set of statements relate to the EASE or DIFFICULTY of NOT GOING NEAR THE REEF (within 10cm) when scuba diving in the Mombasa Marine Park.

	STRONGLY AGREE	GENERALLY AGREE	MILDLY AGREE	NEITHER AGREE NOR DISAGREE	MILDLY DISAGREE	GENERALLY DISAGREE	STRONGLY DISAGREE
The environmental conditions (current, surge, visibility etc.) could influence whether I am able to NOT GO NEAR THE REEF (within 10cm) when scuba diving.	O	O	O	O	O	O	O
The environmental conditions will make it more difficult for me NOT TO GO NEAR THE REEF (within 10cm) when scuba diving.	O	O	O	O	O	O	O
I am confident that the environmental conditions will not affect me when it comes to NOT GOING NEAR THE REEF (within 10cm) while scuba diving in the Mombasa Marine Park.	O	O	O	O	O	O	O

THANK YOU FOR YOUR TIME
ENJOY THE REST OF YOUR VISIT IN THE MOMBASA MARINE PARK AND RESERVE

Snorkelers Elicitation Survey

A. Behavioral Beliefs

1. What do you see as the advantages or good things that could result if you do not make contact with the living substrate (corals and other living organisms) today?

2. What do you see as the disadvantages or bad things that could result if you do not make contact with the living substrate (corals and other living organisms) today?

B. Normative Beliefs

a. Injunctive norms: *If you considered not making contact with the living substrate (corals and other living organisms) today, there might be certain individuals or groups (you know, people important to you and whose opinion actually matters) that would think you either should or should not do it.*

1. Who are the people or groups who would approve of, or who would encourage you, not to make contact with the living substrate (corals and other living organisms)?

2. Who are the people or groups who would disapprove of, or who would discourage you, not to make contact with the living substrate (corals and other living organisms)?

b. Descriptive norms: *Sometimes, when we are not sure what to do in a particular situation, we look to see what other people are doing. When it comes to not making contact with the living substrate (corals or other living organisms) today, please list the individuals or groups whose own behavior you might look to for guidance.*

1. Which of these people is most likely not to make contact with the living substrate (corals and other living organisms) today?

2. Which of these people is least likely not to make contact with the living substrate (corals and other living organisms) today?

C. Control Beliefs

1. Please list any factors or circumstances that would make it easy or enable you not to make contact with the living substrate (corals and other living organisms) today.

2. Please list any factors or circumstances that would make it difficult or prevent you not to make contact with the living substrate (corals and other living organisms) today.

Pre-Excursion Questionnaire

RECREATIONAL RESOURCE USE SURVEY
MOMBASA MARINE PARK AND RESERVE, KENYA

JAMES COOK UNIVERSITY AUSTRALIA

Preliminary Information and definitions for Participants
The following questions focus on how visitors use the reef in the Mombasa Marine Park and Reserve. Please know that there are no right or wrong answers to the following questions, nor are some responses better or worse than others. Park managers simply want to know your honest opinions about using the reef.

-Be sure to answer all questions-do not omit any

These first questions aim to find out why people use the marine park. Please provide brief answers to the following questions.

1. What do you expect to see on your snorkeling excursion today? (no more than 5 words)

   ____

2. What do you hope to gain from today's snorkeling excursion? (no more than 5 words)

   ____

3. Why do you snorkel? (one word) ______________________________

Please tick the best answer or answers as indicated by each question.

4. What best describes the main building blocks of reefs (***please tick ONE answer***):
   - ☐ CORALS
   - ☐ ROCKS
   - ☐ CALCIUM DEPOSITS
   - ☐ OLD VOLCANIC LAVA
   - ☐ DON'T KNOW

5. What best describes corals (***please tick ONE answer***):
   - ☐ LIVING ROCK
   - ☐ COLORFUL ROCK
   - ☐ A PLANT
   - ☐ AN ANIMAL
   - ☐ COLONY OF ORGANISMS
   - ☐ DON'T KNOW

6. Coral gets its color from (***please tick the answer(s)***):
   - ☐ THE SUN
   - ☐ OTHER ORGANISMS
   - ☐ DYES (COLOURS) FOUND IN THE WATER
   - ☐ SURROUNDING ROCKS
   - ☐ MINERALS
   - ☐ DON'T KNOW

7. Corals can suffer damage from (***please tick the answer(s)***):
   - ☐ SNORKELER/DIVER CONTACT
   - ☐ CLIMATE CHANGE
   - ☐ POLLUTION
   - ☐ FISH
   - ☐ BOATS RUNNING INTO CORALS
   - ☐ CROWN OF THORNS
   - ☐ DYNAMITE FISHING
   - ☐ DON'T KNOW
   - ☐ OTHER_________

8. **Tick the item(s)** that is/are alive on a reef:
   - ☐ ALGAE
   - ☐ CORAL
   - ☐ SPONGES
   - ☐ ANEMONES
   - ☐ ROCKS
   - ☐ SEAWEED
   - ☐ SHELLS

9. Do you believe corals to be living organisms?

   _____ YES THEY ARE LIVING ORGANISMS, **PLEASE GO TO QUESTION 10**

   _____ NO THEY ARE NON-LIVING MATTER, **PLEASE GO TO QUESTION 11**

10. Coral growth is best expressed by (***please tick ONE answer***):
    - ☐ THEY DO NOT GROW
    - ☐ MM'S PER YEAR
    - ☐ CM'S PER YEAR
    - ☐ M'S PER YEAR
    - ☐ 100M'S PER YEAR
    - ☐ DON'T KNOW

*If you have answered **question 10** please skip **question 11** and continue with **question 12**.*

11. Describe the size of corals (***please tick ONE answer***):
    - ☐ CORALS GET BIGGER OVER TIME
    - ☐ REMAIN UNCHANGED OVER TIME
    - ☐ GET SMALLER OVER TIME
    - ☐ DON'T KNOW

12. Starting at **1** and finishing at **5**, rank the following reasons for maintaining a safe distance from the reef in order of importance to you (**1=most important, 5=least important**):

    ____ PROTECTION OF REEF,

    ____ PRESERVATION OF REEF,

    ____ SELF-PRESERVATION,

    ____ NOT INTERFERING WITH LIFE ON REEF,

    ____ INCREASED FINANCIAL GAINS FOR PEOPLE MAKING A LIVING

The purpose of the next series of questions is to find out your personal opinion regarding the reef in the Mombasa Marine Park and Reserve. Place an x on the line that represents how strongly you believe the statement.

13. Snorkelers who will visit these reefs in the future should be able to enjoy these reefs.
    STRONGLY DISAGREE :_____:_____:_____:_____:_____:_____:_____: STRONGLY AGREE

14. Fish that live on a reef should be able to seek shelter on that reef.
    DEFINITELY TRUE :_____:_____:_____:_____:_____:_____:_____: DEFINITELY FALSE

15. For me to go and snorkel on a coral reef today is *(please complete all 5 statements)*:
    A) HARMFUL :______:______:______:______:______:______:______: BENEFICIAL
    B) PLEASANT :______:______:______:______:______:______:______: UNPLEASANT
    C) GOOD :______:______:______:______:______:______:______: BAD
    D) WORTHLESS:______:______:______:______:______:______:______: VALUABLE
    E) ENJOYABLE :______:______:______:______:______:______:______: UNENJOYABLE

16. For me to gain a better understanding of life in the sea is:
    EXTREMELY GOOD :_____:_____:_____:_____:_____:_____:_____: EXTREMELY BAD

17. For me to be able to interact with life in the sea is:
    EXTREMELY GOOD :_____:_____:_____:_____:_____:_____:_____: EXTREMELY BAD

18. For me to develop good snorkeling skills is:
    EXTREMELY GOOD :_____:_____:_____:_____:_____:_____:_____: EXTREMELY BAD

19. My getting information and explanations on life in the sea is:
    EXTREMELY GOOD :_____:_____:_____:_____:_____:_____:_____: EXTREMELY BAD

20. I intend to avoid disturbing life on the reef while snorkeling today.
    DEFINITELY TRUE :_____:_____:_____:_____:_____:_____:_____: DEFINITELY FALSE

21. For me to avoid interfering with any life on the reef when I snorkel today is:
    EXTREMELY DIFFICULT :_____:_____:_____:_____:_____:_____:_____: EXTREMELY EASY

22. I will make an effort to avoid disturbing any life on the reef while snorkeling today.
    I DEFINITELY WILL :_____:_____:_____:_____:_____:_____:_____: I DEFINITELY WILL NOT

23. I am personally able to control how I will snorkel today.
    EXTREMELY DIFFICULT :_____:_____:_____:_____:_____:_____:_____: EXTREMELY EASY

24. For me to go out and not disturb any life on the reef while snorkeling today would be:
POSSIBLE :_____:_____:_____:_____:_____:_____:_____: IMPOSSIBLE

25. If I wanted to I could not disturb any life on the reef when I snorkel today.
DEFINITELY TRUE :_____:_____:_____:_____:_____:_____:_____: DEFINITELY FALSE

26. How much control do you believe you have over not disturbing any life on the reef when you snorkel today?
NO CONTROL :_____:_____:_____:_____:_____:_____:_____: COMPLETE CONTROL

27. It is mostly up to me whether I disturb life on a reef when I snorkel today.
STRONGLY DISAGREE :_____:_____:_____:_____:_____:_____:_____: STRONGLY AGREE

28. I believe that I have
COMPLETE CONFIDENCE :_____:_____:_____:_____:_____:_____:_____: NO CONFIDENCE
in my swimming abilities when I snorkel today.

29. I believe that I have
COMPLETE CONFIDENCE :_____:_____:_____:_____:_____:_____:_____: NO CONFIDENCE
about using the snorkel equipment to snorkel today on the reef.

30. Most people who are important to me think that
I SHOULD :_____:_____:_____:_____:_____:_____:_____: I SHOULD NOT
disturb any life on the reef while I snorkel today.

31. It is expected of me that I should not disturb any life on the reef while I snorkel today.
EXTREMELY LIKELY :_____:_____:_____:_____:_____:_____:_____: EXTREMELY UNLIKELY

32. The people in my life whose opinions I value would
APPROVE :_____:_____:_____:_____:_____:_____:_____: DISAPPROVE
of me not disturbing life on the reef while snorkeling today.

33. Most people who are important to me do not disturb life on a reef when they snorkel.
COMPLETELY TRUE :_____:_____:_____:_____:_____:_____:_____: COMPLETELY FALSE

34. The people in my life whose opinions I value
DO NOT :_____:_____:_____:______:_____:_____:_____: DO
disturb life on a reef when they snorkel.

35. Many people like me do not disturb life on a reef when they snorkel.
EXTREMELY LIKELY :_____:_____:_____:_____:_____:_____:_____: EXTREMELY UNLIKELY

36. Generally speaking, how much do you care what your snorkel guide thinks you should do?

NOT AT ALL :_____:_____:_____:_____:_____:_____:_____: VERY MUCH

37. Generally speaking, how much do you care what the other group members think you should do?
NOT AT ALL :_____:_____:_____:_____:_____:_____:_____: VERY MUCH

38. Generally speaking, how much do you care what your friends think you should do?
NOT AT ALL :_____:_____:_____:_____:_____:_____:_____: VERY MUCH

39. Generally speaking, how much do you care what the marine park authority (Kenya Wildlife Service) think you should do?
NOT AT ALL :_____:_____:_____:_____:_____:_____:_____: VERY MUCH

40. For me to avoid any disturbance to life on the reef when I snorkel today is
A) HARMFUL :______:______:______:______:______:______:______: BENEFICIAL
B) PLEASANT :______:______:______:______:______:______:______: UNPLEASANT
C) GOOD :______:______:______:______:______:______:______: BAD
D) WORTHLESS:______:______:______:______:______:______:______: VALUABLE
E) ENJOYABLE :______:______:______:______:______:______:______: UNENJOYABLE

41. The snorkel guide thinks that I should not disturb any life on the reef when I snorkel today.
EXTREMELY LIKELY :_____:_____:_____:_____:_____:_____:_____: EXTREMELY UNLIKELY

42. Other members of the snorkel group think that I should not disturb any life on the reef when I snorkel today.
EXTREMELY LIKELY :_____:_____:_____:_____:_____:_____:_____: EXTREMELY UNLIKELY

43. My friends think that I should not disturb any life on the reef when I snorkel today.
EXTREMELY LIKELY :_____:_____:_____:_____:_____:_____:_____: EXTREMELY UNLIKELY

44. The marine park authority (Kenya Wildlife Service) thinks that I should not disturb any life on the reef when I snorkel today.
EXTREMELY LIKELY :_____:_____:_____:_____:_____:_____:_____: EXTREMELY UNLIKELY

THANK YOU FOR YOUR TIME
ENJOY THE REST OF YOUR VISIT IN THE MOMBASA MARINE PARK AND RESERVE

Post-Excursion Questionnaire

VISITOR EXPERIENCE SURVEY
MOMBASA MARINE PARK AND RESERVE, KENYA

Preliminary Information and definitions for Participants
The following questions focus on visitor satisfaction with excursions in the Mombasa Marine Park and Reserve. When questions refer to your excursion of the reef, please think only of your experience here today. Please know that there are no right or wrong answers to the following questions, nor are some responses better or worse than others. Park managers simply want to know your honest opinions about excursions to the reef.

-Be sure to answer all questions-do not omit any

I. General Responses About Your Excursion Today

Please answer questions 1 and 2 by ***ticking yes or no****.* ***If you tick yes*** *for either (or both) please provide a* ***brief*** *written answer. Be as specific as possible.*

1. Think about your excursion today, were there things that stand out as adding to your enjoyment?

_____ NO IF NO, GO TO **NUMBER 2** BELOW
_____ YES

If yes, please tell us what these things were and where each occurred.
a. The thing that added most to my enjoyment was:___________________________________
Where did it occur? (example-boat, water, beach)
____

b. Another thing that added to my enjoyment was:
____
Where did it occur? (example-boat, water, beach)
____

2. Were there things during today's excursion that stand out as detracting from your enjoyment?

_____ NO IF NO, GO TO **NUMBER 3** BELOW .
_____ YES

If yes, please tell us what these things were and where each occurred.

a. The thing that detracted most from my enjoyment was:_____________________________
Where did it occur? (example-boat, water, beach)
____

b. Another thing that detracted from my enjoyment was:_____________________________
Where did it occur? (example-boat, water, beach)___________________________________

3. How do you feel other coral reefs you have visited compare to what you have seen here? (*Please tick ONE answer*)

_____ TODAY'S REEF WAS BETTER THAN OTHERS I HAVE SEEN
_____ TODAY'S REEF WAS ABOUT THE SAME AS OTHERS I HAVE SEEN
_____ TODAY'S REEF WAS NOT AS GOOD AS OTHER'S I HAVE SEEN
_____ TODAY'S REEF WAS THE FIRST REEF I HAVE SEEN

4. **In preparation for this visit, where did you obtain information about Mombasa Marine Park and Reserve?** (*Please tick all that apply*)

___DID NOT OBTAIN ANY
___MOMBASA MARINE PARK BROCHURE
___BEACH HAWKER
___RADIO/TV/NEWSPAPER/MAGAZINE
___INTERNET
___FRIENDS OR RELATIVES
___TOUR OPERATOR REPRESENTATIVE
___TOURIST GUIDEBOOK
___HOTEL STAFF
___OTHER (PLEASE SPECIFY) ________________________

II. Evaluation of Your Excursion Today

5. Some things that visitors might get from today's excursion are listed below. Please indicate **how important each item was for you by ticking a space**.

This excursion allowed me to:	VERY IMPORTANT	SLIGHTLY IMPORTANT	NIETHER IMPORTANT NOR UN-IMPORTANT	SLIGHLTY NOT IMPORTANT	NOT AT ALL IMPORTANT	NOT RELEVANT
BE CLOSE TO FRIENDS OR FAMILY	○	○	○	○	○	○
GET SOME EXERCISE	○	○	○	○	○	○
EXPERIENCE THE BEAUTY OF NATURE	○	○	○	○	○	○
MEET NEW PEOPLE	○	○	○	○	○	○
HAVE SOME EXCITEMENT	○	○	○	○	○	○
EXPERIENCE AN UNDEVELOPED ENVIRONMENT	○	○	○	○	○	○
REST AND RELAX	○	○	○	○	○	○
LEARN MORE ABOUT NATURE	○	○	○	○	○	○
TO BE ALONE	○	○	○	○	○	○
BE WITH OTHERS WHO ENJOY THINGS THAT I ENJOY	○	○	○	○	○	○
DEVELOP SKILLS	○	○	○	○	○	○
ESCAPE THE NORMAL ROUTINE	○	○	○	○	○	○
BE IN A NATURAL PLACE	○	○	○	○	○	○
EXPERIENCE SOMETHING NEW AND DIFFERENT	○	○	○	○	○	○
LEARN ABOUT A CORAL REEF	○	○	○	○	○	○
OTHER (PLEASE SPECIFY)	○	○	○	○	○	○

6. **Did you touch any coral today (with hands, fins, etc. that you are aware of)?**
_____ NO IF NO, GO TO **NUMBER 7** BELOW.
_____ YES

If yes, please tick the item that best describes why you touched the coral.
_____ TO BALANCE MYSELF
_____ TO REST BECAUSE I WAS TIRED
_____ TO SEE WHAT IT FELT LIKE
_____ TOUCHED BY ACCIDENT
_____ OTHER (PLEASE SPECIFY) ______________________________

7. **Approximately how many people were on your excursion today including yourself (and others on the boat) but excluding the crew?**

_____ ≤5 PEOPLE _____ 6-10 PEOPLE _____ 11-15 PEOPLE _____ >15 PEOPLE

8. What type of group are you travelling with today? (***Please tick all that apply***)
In the right column please indicate **how many people (including yourself) are in each group you tick.**

GROUP	# IN GROUP
____ I AM ALONE	__1__
____ WITH PARTNER OR SPOUSE ONLY	_____
____ WITH FAMILY	_____
____ WITH FRIENDS	_____
____ ORGANISED GROUP OR CLUB	_____
____ BUSINESS ASSOCIATES	_____
____ OTHER (PLEASE SPECIFY) ________________	_____

9. Items listed below describing marine life **may have influenced your enjoyment** today in a positive or negative way. Please indicate how each of these items influenced your enjoyment by **ticking a space from *VERY NEGATIVELY* to *VERY POSITIVELY*** for each.

My enjoyment was influenced by the:	VERY NEGATIVELY	SLIGHTLY NEGATIVELY	NEITHER NEG. OR POS.	SLIGHTLY POSITIVELY	VERY POSITIVELY
FISH:					
TOTAL NUMBER OF FISH I SAW	○	○	○	○	○
TYPES OF FISH I SAW	○	○	○	○	○
SIZE OF THE FISH I SAW	○	○	○	○	○
COLOUR OF THE FISH I SAW	○	○	○	○	○
BEHAVIOUR OF THE FISH	○	○	○	○	○
CORAL:					
TOTAL AMOUNT OF CORAL I SAW	○	○	○	○	○
NUMBER OF DIFFERENT KINDS OF CORAL I SAW	○	○	○	○	○
SIZE OF THE CORAL I SAW	○	○	○	○	○
COLOUR OF THE CORALS I SAW	○	○	○	○	○
NUMBER OF ANIMALS OTHER THAN CORAL OR FISH (CLAMS, SEA STARS) THAT I SAW	○	○	○	○	○
	POOR	LESS THAN AVERAGE	AVERAGE	BETTER THAN AVERAGE	EXCELLENT
OVERALL, THE CORAL I SAW WAS	○	○	○	○	○
OVERALL, THE FISH I SAW WERE	○	○	○	○	○

10. Other items listed below **may have influenced your enjoyment** today in a positive or negative way. Please indicate how each of these items influenced your enjoyment by **ticking a space from *VERY POSITIVELY* to *VERY NEGATIVELY*** for each.

My enjoyment was influenced by the:	VERY POSITIVELY	SLIGHTLY POSITIVELY	NEITHER NEG. OR POS.	SLIGHTLY NEGATIVELY	VERY NEGATIVELY
TEMPERATURE OF THE WATER	○	○	○	○	○
TEMPERATURE OF THE AIR	○	○	○	○	○
CLARITY (VISIBILITY) OF THE OCEAN WATER	○	○	○	○	○
DEPTH OF THE WATER WHERE I SNORKELED	○	○	○	○	○
CURRENTS IN THE WATER AROUND THE REEF	○	○	○	○	○
AMOUNT OF WIND	○	○	○	○	○
SEA CONDITIONS DURING THE TRIP FROM/TO SHORE	○	○	○	○	○
PRESENCE OF RANGERS	○	○	○	○	○
INFORMATION ON MARINE LIFE	○	○	○	○	○
INFORMATION PROVIDED BY THE STAFF	○	○	○	○	○
AVAILABILITY OF PRE-VISIT INFORMATION ON PARK	○	○	○	○	○
HELPFULNESS OF THE STAFF	○	○	○	○	○
ABSENCE OF RUBBISH/LITTER	○	○	○	○	○
APPEARANCE OF THE STAFF	○	○	○	○	○

11. The number of people near you **may have influenced your enjoyment** today in a positive or negative way. Please indicate how each of these items influenced your enjoyment by **ticking a space from *VERY NEGATIVELY* to *VERY POSITIVELY*** for each.

My enjoyment was influenced by:	VERY NEGATIVELY	SLIGHTLY NEGATIVELY	NEITHER NEG. OR POS.	SLIGHTLY POSITIVELY	VERY POSITIVELY
NUMBER OF PEOPLE ON THE BOAT	○	○	○	○	○
NUMBER OF PEOPLE SNORKELING IN THE WATER FROM YOUR BOAT	○	○	○	○	○
BEHAVIOR OF OTHER VISITORS FROM YOUR BOAT	○	○	○	○	○
NUMBER OF PEOPLE SNORKELING IN THE WATER FROM OTHER BOATS	○	○	○	○	○
BEHAVIOR OF OTHER VISITORS FROM OTHER BOATS	○	○	○	○	○

12. **Did you feel too crowded today during any part of your excursion?**

______ NO IF NO, GO TO **NUMBER 13** BELOW .

______ YES, PLEASE INIDCATE WHERE YOU FELT CROWDED

(IN WATER, ON BOAT, AT BEACH) ______________________

13. **Did you receive any presentations today during your excursion?**

☐ YES

☐ NO

For the next question please place an x on the line that represents how strongly you believe the statement

14. **Overall, the guided activities and/or presentations I attended today…**

a) MADE ME CURIOUS _____ : _____ : _____ : ______: _____ : ______ : ______ DID *NOT* MAKE ME CURIOUS

b) DID *NOT* MAKE ME THINK ______ : ______ : ______ : ______ : ______ : ______ : ______ MADE ME THINK

c) MADE ME WANT TO TALK ABOUT WHAT I HEARD ______ : _____ : _____ : _____ : _____ : _____ : ______ DID *NOT* MAKE ME WANT TO TALK ABOUT WHAT I HEARD

d) DID *NOT* MAKE ME WANT TO KNOW MORE ______ : ______ : _____ : _____ : _____ : _____ : _____ MADE ME WANT TO KNOW MORE

e) INTRIGUED ME ______ : ______ : ______ : ______ : ______ : ______ : ______ DID *NOT* INTRIGUE ME

15. **How satisfied were you with each aspect of the guided activities or presentation? (Tick one space)**

I WAS SATISFIED WITH:	VERY SATISFIED	SATISFIED	SLIGHTLY SATISFIED	NEITHER SATISFIED NOR DISSATISFIED	SLIGHTLY DISSATISFIED	DISSATISFIED	VERY DISSATISFIED
THE AMOUNT OF INTERACTION AVAILABLE (I.E. GETTING INVOLVED, CHOICE, ASKING QUESTIONS, PARTICIPATING)	○	○	○	○	○	○	○
THE USE OF DIAGRAMS, ILLUSTRATIONS OR PICTURES	○	○	○	○	○	○	○
HOW THE INFORMATION WAS WORDED OR EXPLAINED	○	○	○	○	○	○	○
ASSISTANCE FROM GUIDES/STAFF/VOLUNTEERS ON PROVIDING FURTHER INFORMATION	○	○	○	○	○	○	○

III. Your Feelings Towards Marine Parks in General

16. Think about marine parks generally (***NOT*** just the Mombasa Marine Park). **Using the scale below, please indicate how important each of the following park attributes and services would be to your enjoyment while visiting or staying in national parks. (Tick one of the spaces provided*)***

THE FOLLOWING IS IMPORTANT TO ME	VERY IMPORTANT	IMPORTANT	SLIGHTLY IMPORTANT	NEITHER IMPORTANT NOR UNIMPORTANT	SLIGHTLY UNIMPORTANT	UNIMPORTANT	VERY UNIMPORTANT
INFORMATION ON MARINE LIFE	○	○	○	○	○	○	○
ABSENCE OF RUBBISH/LITTER	○	○	○	○	○	○	○
PRESENCE OF RANGERS AND OTHER STAFF	○	○	○	○	○	○	○
NOT TOO MANY PEOPLE	○	○	○	○	○	○	○
BEHAVIOR OF OTHER VISITORS	○	○	○	○	○	○	○
AVAILABILITY OF PRE-VISIT INFORMATION ON PARK	○	○	○	○	○	○	○

IV. Future Excursions

17. **How would you rate your excursion today?** (***Please circle a number that best represents your feeling***)

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 --------- 7 -------- 8 -------- 9 -------- 10
POOR EXCELLENT

18. **Would you recommend a GLASS BOTTOM BOAT EXCURSION in the Mombasa Marine Park to your friends, family or others?**

- ☐ YES
- ☐ NO

V. What Type of Visitors Use the Excursions

19. **Is this your first visit to the Mombasa Marine Park and Reserve? (*Please tick ONE answer*)**

- ☐ YES
- ☐ NO

20. **How often do you go on holiday where there is a snorkeling option?** (***Please tick ONE answer***)

- ☐ MORE THAN 3 TIMES PER YEAR
- ☐ 2-3 TIMES PER YEAR
- ☐ ONCE PER YEAR
- ☐ LESS THAN ONCE PER YEAR

21. **What types of groups do you snorkel with most often? (*Please tick ONE answer*)**

- ☐ FAMILY
- ☐ FRIENDS
- ☐ BY YOURSELF
- ☐ FAMILY AND FRIENDS TOGETHER
- ☐ CLUB

22. **How long have you been snorkeling? (*Please tick ONE answer*)**

- ☐ FIRST TIME
- ☐ 6 MONTHS
- ☐ 1 YEAR
- ☐ 2-3 YEARS
- ☐ 4-6 YEARS
- ☐ 7-10 YEARS
- ☐ MORE THAN 10 YEARS

23. **Compared to other outdoor activities that you participate in, how important is snorkeling to you** (***please tick ONE answer***):

- ☐ MOST IMPORTANT ACTIVITY
- ☐ SECOND MOST IMPORTANT ACTIVITY
- ☐ ONE OF MANY ACTIVITIES I PARTICIPATE IN
- ☐ NOT AT ALL IMPORTANT

24. **Are you** (***please tick ONE answer***):

- ☐ MALE
- ☐ FEMALE

25. **In what year were you born? _______**

26. **What is your country of residence? ________________**

27. **What is your preferred language? __________________**

28. **Your name: _____________________________________**

29. **Your email address: ______________________________**

THANK YOU FOR YOUR TIME
ENJOY THE REST OF YOUR VISIT IN THE MOMBASA MARINE PARK AND RESERVE

If there are other things you would like to tell us please do so here:

____
__

____
__

____
__

____
__

____
__
__

Web Questionnaire

The following questions focus on how visitors use the reefs while snorkeling in marine parks. Please know that there are no right or wrong answers to the following questions, nor are some responses better or worse than others. Park managers simply want to know your honest opinions about using the reef.

1. Please finish the statement by choosing the best response:

	Complete confidence	A lot of confidence	Confidence	Neutral amount of confidence	Little confidence	Very little confidence	No confidence
If I think of my swimming abilities when I snorkel, I believe I have ___________ in my swimming abilities.							

2. Please answer each statement below:

	Extremely good	Good	Slightly good	Neither good nor bad	Slightly bad	Bad	Extremely bad
For me to gain a better understanding of life in the sea is:							
For me to develop good snorkeling skills is:							
My getting information and explanations on life in the sea is:							

3. Please finish the statement by choosing the best response:

	No Confidence	Very little confidence	Little confidence	Neutral amount of confidence	Confidence	A lot of confidence	Complete confidence
If I think about my abilities in using snorkel equipment when I snorkel, I believe that I have ___________ in using the snorkel equipment.							

4. Please agree/disagree with each statement below:

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
Snorkelers who will visit reefs in the future should be able to enjoy the reefs.							
It is mostly up to me whether I disturb life on a reef when I snorkel.							
I will make an effort to avoid disturbing any life on a reef while snorkeling.							

5. Please answer each statement below:

	Extremely easy	Easy	Slightly easy	Neither easy nor difficult	Slightly difficult	Difficult	Very Difficult
For me to avoid interfering with any life on the reef when I snorkel in the future is:							
I believe my ability to control how I will snorkel during future snorkel trips will be:							

6. Please answer each statement below:

	Definitely true	True	Slightly true	Neither true nor false	Slightly false	False	Definitely false
When I snorkel I intend to avoid disturbing life on the reef.							
If I wanted to I could not disturb any life on the reef when I snorkel.							

7. Has your snorkel excursion in the Mombasa Marine Park influenced the way in which you snorkel?

Yes **No**

8. If the answer to the previous question was "yes", please indicate which best describes your changed snorkel behavior.

	Yes	No	Unchanged
More careful			
More aware			
More confident			
More informed			

Other (please specify)

9. If you think back to your snorkel excursion in the Mombasa Marine Park, please rate the importance of how the following statements influenced you about NOT disturbing life on a reef when you snorkel in the future:

	Very important	Important	Slightly important	Neither important nor unimportant	Slightly unimportant	Unimportant	Very Unimportant
Information on marine life provided by the crew on the boat							
General assistance provided by the crew on the boat							
Snorkel instructions provided by the crew on the boat							

Appendix 5: Appendices to Chapters 2,3 and 4

Chapter 2 Appendix

Linear Regression tables showing how the number of contacts made by the snorkelers and the guides for the duration of their snorkel is influenced by cloud coverage, current strength, underwater horizontal visibility and relative tidal height at the time of the snorkeling excursion. Sample size is 167 snorkelers and 38 guides.

Snorkelers-Alive Intentional
A linear regression was conducted to determine if the total number of alive intentional contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=0.961, n=167)=778.331, p=0.430. The table below indicates that none of the variables contributed significantly to the model.

Model[b]		Coefficients(a)				
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.934	4.017		1.228	0.221
	Cloud coverage	-0.371	0.51	-0.058	-0.726	0.469
	Current	1.813	1.271	0.111	1.426	0.156
	Visibility	0.081	0.755	0.011	0.107	0.915
	Tidal height	-0.014	0.016	-0.083	-0.843	0.401

a. Dependent Variable: contacts
b. Model Information: R-square=0.023, df=4, F=0.961 and sig=0.43

Snorkelers-Dead Intentional
A linear regression was conducted to determine if the total number of dead intentional contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=2.34, n=167)=269.193, p=0.057. The table below indicates that one of the variables (current) contributed significantly to the model.

Model[b]		Coefficients(a)				
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.93	1.514		1.935	0.055
	Cloud coverage	-0.206	0.192	-0.084	-1.071	0.286
	Current	0.987	0.479	0.158	2.059	0.041
	Visibility	-0.033	0.285	-0.011	-0.114	0.909
	Tidal height	-0.008	0.006	-0.132	-1.35	0.179

a. Dependent Variable: contacts
b. Model Information: R-square=0.055, df=4, F=2.34 and sig=0.057

Snorkelers-Seagrass
A linear regression was conducted to determine if the total number of seagrass contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=2.004, n=167)=149.377, p=0.096. The table below indicates that none of the variables contributed significantly to the model.

Model^b	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	3.275	1.219		2.687	0.008
Cloud coverage	0.191	0.155	0.097	1.236	0.218
Current	-0.011	0.386	-0.002	-0.028	0.978
Visibility	-0.252	0.229	-0.109	-1.098	0.274
Tidal height	-0.005	0.005	-0.094	-0.964	0.337

a. Dependent Variable: contacts
b. Model Information: R-square=0.047, df=4, F=2.004 and sig=0.096

Snorkelers-Accidental

A linear regression was conducted to determine if the total number of accidental contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=0.241, n=167)=184.97, p=0.915. The table below indicates that none of the variables contributed significantly to the model.

Model^b	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	8.695	3.915		2.221	0.028
Cloud coverage	-0.435	0.497	-0.07	-0.874	0.383
Current	-0.294	1.239	-0.019	-0.238	0.812
Visibility	-0.413	0.736	-0.057	-0.561	0.575
Tidal height	0.005	0.016	0.031	0.306	0.76

a. Dependent Variable: contacts
b. Model Information: R-square=0.006, df=4, F=0.241 and sig=0.915

Snorkelers-Wildlife Handling

A linear regression was conducted to determine if the total number of wildlife handling behavior made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=1.272, n=167)=24.406, p=0.283. The table below indicates that none of the variables contributed significantly to the model.

Model^b	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	1.081	0.631		1.713	0.089
Cloud coverage	-0.146	0.08	-0.144	-1.818	0.071
Current	0.129	0.2	0.05	0.644	0.52
Visibility	-0.082	0.119	-0.069	-0.688	0.492
Tidal height	0.003	0.003	0.128	1.295	0.197

a. Dependent Variable: contacts
b. Model Information: R-square=0.03, df=4, F=1.272 and sig=0.283

Guides-Alive Intentional

A linear regression was conducted to determine if the total number of alive intentional contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=2.106, n=38)=838.272, p=0.102. The table below indicates that one of the variables (current) contributed significantly to the model.

Model[b]	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	-2.94	5.752		-0.511	0.613
Cloud coverage	0.336	0.859	0.062	0.391	0.698
Current	4.454	1.765	0.397	2.524	0.017
Visibility	1.336	1.053	0.235	1.27	0.213
Tidal height	-0.023	0.022	-0.191	-1.024	0.313

a. Dependent Variable: contacts
b. Model Information: R-square=0.203, df=4, F=2.106 and sig=0.102

Guides-Dead Intentional

A linear regression was conducted to determine if the total number of dead intentional contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was statistically significant, ANOVA sum of squares (df=4, F=3.381, n=38)=1648.11, p=0.020. The table below indicates that one of the variables (current) contributed significantly to the model.

Model[b]	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	-3.065	6.366		-0.481	0.633
Cloud coverage	0.629	0.951	0.099	0.662	0.512
Current	6.587	1.953	0.501	3.372	0.002
Visibility	0.799	1.165	0.12	0.686	0.498
Tidal height	-0.022	0.025	-0.154	-0.875	0.388

a. Dependent Variable: contacts
b. Model Information: R-square=0.291, df=4, F=3.381 and sig=0.02

Guides-Seagrass

A linear regression was conducted to determine if the total number of seagrass contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=1.745, n=38)=269.838, p=0.164. The table below indicates that none of the variables contributed significantly to the model.

Model[b]	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	6.898	3.586		1.924	0.063
Cloud coverage	-0.491	0.535	-0.147	-0.918	0.365
Current	1.588	1.1	0.231	1.443	0.158
Visibility	-0.429	0.656	-0.123	-0.653	0.518
Tidal height	-0.016	0.014	-0.225	-1.186	0.244

a. Dependent Variable: contacts
b. Model Information: R-square=0.175, df=4, F=1.745 and sig=0.164

Guides-Accidental

A linear regression was conducted to determine if the total number of accidental contacts made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=0.476, n=38)=73.88, p=0.753. The table below indicates that none of the variables contributed significantly to the model.

Model[b]		Coefficients(a)				
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.777	3.591		1.33	0.193
	Cloud coverage	0.138	0.536	0.044	0.258	0.798
	Current	0.674	1.102	0.105	0.612	0.545
	Visibility	-0.641	0.657	-0.196	-0.975	0.337
	Tidal height	0.001	0.014	0.02	0.098	0.923

a. Dependent Variable: contacts
b. Model Information: R-square=0.055, df=4, F=0.476 and sig=0.753

Guides-Wildlife Handling

A linear regression was conducted to determine if the total number of wildlife handling behavior made by the snorkelers was influenced by the surrounding water and environmental conditions. The model contained four independent variables (cloud coverage, current, visibility and tidal height). The full model containing all variables was not statistically significant, ANOVA sum of squares (df=4, F=1.189, n=38)=95.038, p=0.334. The table below indicates that none of the variables contributed significantly to the model.

Model[b]		Coefficients(a)				
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-2.302	2.578		-0.893	0.378
	Cloud coverage	0.289	0.385	0.124	0.751	0.458
	Current	0.471	0.791	0.098	0.596	0.555
	Visibility	0.566	0.472	0.232	1.199	0.239
	Tidal height	0.009	0.01	0.166	0.851	0.401

a. Dependent Variable: contacts
b. Model Information: R-square=0.126, df=4, F=1.189 and sig=0.334

Chapter 3 Appendix

Average strengths, evaluations, motivations to comply, power measures and cross-products of the salient beliefs about not getting close to the reef substrate while scuba diving for compliers and non-compliers (shown for the first 15 minutes of a scuba dive).

		Compliers	Non-compliers	Difference	p-value
Protect the reef (behavioral belief)	Strength	5.17	4.77	0.40	0.218
	Evaluation	2.74	2.82	0.08	0.519
	Cross-product	14.35	13.49	0.86	0.447
Not able to see as much (behavioral belief)	Strength	2.36	2.01	0.35	0.491
	Evaluation	-1.40	-1.30	0.10	0.668
	Cross-product	-2.55	-2.60	0.05	0.968
Dive guides most likely not to get close to reef (descr. norm. belief)	Strength	1.91	1.92	0.01	0.993
	Motivation to Comply	4.59	4.73	0.14	0.614
	Cross-product	8.77	9.37	0.60	0.709
Dive guides most likely to approve of me not getting close to reef (injunc. norm. belief)	Strength	2.09	2.08	0.01	0.995
	Motivation to Comply	5.22	5.42	0.20	0.340
	Cross-product	11.17	11.42	0.25	0.904
Buoyancy control would make it easier not to get close to reef (control belief)	Strength	2.13	2.35	0.22	0.523
	Power Measure	5.09	5.04	0.05	0.859
	Cross-product	11.26	12.19	0.93	0.614
Environmental conditions make it more difficult not to get close to reef (control belief)	Strength	4.65	4.96	0.31	0.311
	Power Measure	0.43*	1.55*	1.12	0.021
	Cross-product	3.13*	8.28*	5.15	0.029

**Indicates significant differences between the compliers and non-compliers (independent samples t-test, n=94).*

Average strengths, evaluations, motivations to comply, power measures and cross-products of the salient beliefs about not getting close to the reef substrate while scuba diving for compliers and non-compliers (shown for the second 15 minutes of a scuba dive).

		Compliers	Non-compliers	Difference	p-value
Protect the reef (behavioral belief)	Strength	4.93	4.82	0.11	0.704
	Evaluation	2.84	2.76	0.08	0.486
	Cross-product	14.00	13.40	0.60	0.542
Not able to see as much (behavioral belief)	Strength	1.86	2.31	.045	0.296
	Evaluation	-1.26	-1.40	0.14	0.596
	Cross-product	-2.05	-3.06	1.01	0.353
Dive guides most likely not to get close to reef (descr. norm. belief)	Strength	2.14	1.73	0.41	0.089
	Motivation to Comply	4.83	4.58	0.25	0.272
	Cross-product	10.50	8.20	2.30	0.099
Dive guides most likely to approve of me not getting close to reef (injunc. norm. belief)	Strength	2.30	1.90	0.40	0.197
	Motivation to Comply	5.37	5.37	0.00	0.998
	Cross-product	12.70	10.20	2.50	0.159
Buoyancy control would make it easier not to get close to reef (control belief)	Strength	2.19	2.39	0.20	0.494
	Power Measure	5.05	5.06	0.01	0.950
	Cross-product	11.70	12.20	0.50	0.782
Environmental conditions make it more difficult not to get close to reef (control belief)	Strength	4.95	4.82	0.13	0.619
	Power Measure	1.26	1.29	0.03	0.910
	Cross-product	7.53	6.59	0.94	0.573

The average scores of the compliers and non-compliers for the direct-measure questions in the questionnaire for the first 15 minutes of the scuba dive.

Belief	Scale	Compliers	Non-compliers	p-value
*For me to not go near the reef (within 10cm) when scuba diving in the Mombasa Marine Park is	Average of five responses to bipolar scales (1-7)	2.10	2.30	0.493
Most people that are important to me think that I should not go near the reef (within 10cm) when scuba diving in the Mombasa Marine Park.	Agree (1) to disagree (7)	1.78	2.19	0.221
Most people whose opinions I value would approve of me not going near the reef (within 10cm) when scuba diving in the Mombasa Marine Park	Agree (1) to disagree (7)	3.09	3.14	0.925
I am confident that I will not go near the reef (within 10cm) whilst scuba diving in the Mombasa Marine Park.	Strongly agree (1) to strongly disagree (7)	2.00	2.34	0.315
I am confident that the environmental conditions will not affect me when it comes to not going near the reef (within 10cm) while scuba diving in the Mombasa Marine Park.	Strongly agree (1) to strongly disagree (7)	3.61	3.75	0.753

**This direct behavioral belief measure consisted of five bipolar scales to the attitude statement. The scores to these scales were averaged. The bipolar scales were 1) harmful/beneficial, 2) pleasant/unpleasant, 3) good/bad, 4) worthless/valuable and 5) enjoyable/unenjoyable. The Cronbach's Alpha coefficient was 0.896 for this attitude measure.*

The average scores of the compliers and non-compliers for the direct-measure questions in the questionnaire for the second 15 minutes of the scuba dive.

Belief	Scale	Compliers	Non-compliers	p-value
*For me to not go near the reef (within 10cm) when scuba diving in the Mombasa Marine Park is	Average of five responses to bipolar scales (1-7)	2.09	2.38	0.259
Most people that are important to me think that I should not go near the reef (within 10cm) when scuba diving in the Mombasa Marine Park.	Agree (1) to disagree (7)	1.86	2.28	0.127
Most people whose opinions I value would approve of me not going near the reef (within 10cm) when scuba diving in the Mombasa Marine Park	Agree (1) to disagree (7)	2.91	3.31	0.411
I am confident that I will not go near the reef (within 10cm) whilst scuba diving in the Mombasa Marine Park.	Strongly agree (1) to strongly disagree (7)	2.02	2.46	0.128
I am confident that the environmental conditions will not affect me when it comes to not going near the reef (within 10cm) while scuba diving in the Mombasa Marine Park.	Strongly agree (1) to strongly disagree (7)	3.79	3.65	0.704

**This direct behavioral belief measure consisted of five bipolar scales to the attitude statement. The scores to these scales were averaged. The bipolar scales were 1) harmful/beneficial, 2) pleasant/unpleasant, 3) good/bad, 4) worthless/valuable and 5) enjoyable/unenjoyable. The Cronbach's Alpha coefficient was 0.896 for this attitude measure.*

Chapter 4 Appendix

Various comparisons were made to show that the participants were of the same demographic population. The participants in the WITHOUT and WITH groups were similar when compared across their snorkel experience, reasons for coming on this snorkel excursion, feelings towards marine park attributes and basic demographics (Table 1). Snorkel experience includes how much snorkel experience participants have, their usual snorkel companions, and the importance participants attached to snorkeling as an activity. There was also no difference if this was the participant's first time snorkeling in the Mombasa Marine Park, how other reefs they've seen compared to the Mombasa reef, and the total number of people on their snorkel excursion. Fifteen different reasons participants chose to come on the snorkeling excursion were also measured. Participants then scored each reason on a scale of very important to not at all important. No differences were found between the participants of the WITHOUT and WITH groups for 14 of these reasons (Table 1). The only reason that differed was 'to develop skills' and WITH participants scored this reason with more importance than the WITHOUT group (chi-square test, df=4, p=0.003; contingency table=5-scaled response vs. 2 groups (with/without)). Both groups were also similar in their feelings towards marine park attributes as well as gender and age. These were expected results as no bias was made in the data collection before or after the workshop towards certain demographic traits.

This table shows the different reasons participants have for coming on a snorkel excursion. Participants are from the WITHOUT (interpretation) group and the WITH (interpretation) group and the p-value indicates that there is no significant difference between the participants of both groups (independent samples t-test for 'age' and chi-square test for all others, df=1-9, n=204; contingency tables range from 2 responses to 10 responses vs. 2 groups (with/without)).

	Reason/Characteristic	p-Value
Snorkel Behavior	How long have you been snorkeling	0.652
	Who do you snorkel with most often	0.562
	How important is snorkeling to you	0.265
	First visit to Mombasa Marine Park	0.577
	How do other reefs compare to the Mombasa reef	0.107
	Number of people on your snorkel excursion	0.761
	Where did you obtain information about the park	0.298
Reasons for coming on the snorkel excursion	Be close to friends or family	0.667
	Get some exercise	0.194
	Experience the beauty of nature	0.826
	Meet new people	0.404
	Have some excitement	0.182
	Experience an undeveloped environment	0.632
	Rest and relax	0.219
	Learn more about nature	0.059
	To be alone	0.343
	Be with others who enjoy things that I enjoy	0.444
	Escape the normal routine	0.802
	Be in a natural place	0.869
	Experience something new and different	0.080
	Learn about a coral reef	0.236
Feelings about marine park attributes	Information on marine life	0.414
	Absence of rubbish	0.288
	Presence of rangers	0.735
	Not too many people	0.061
	Behavior of other visitors	0.246
	Availability of pre-visit information on park	0.638
Demo's	Gender	0.945
	Age	0.152